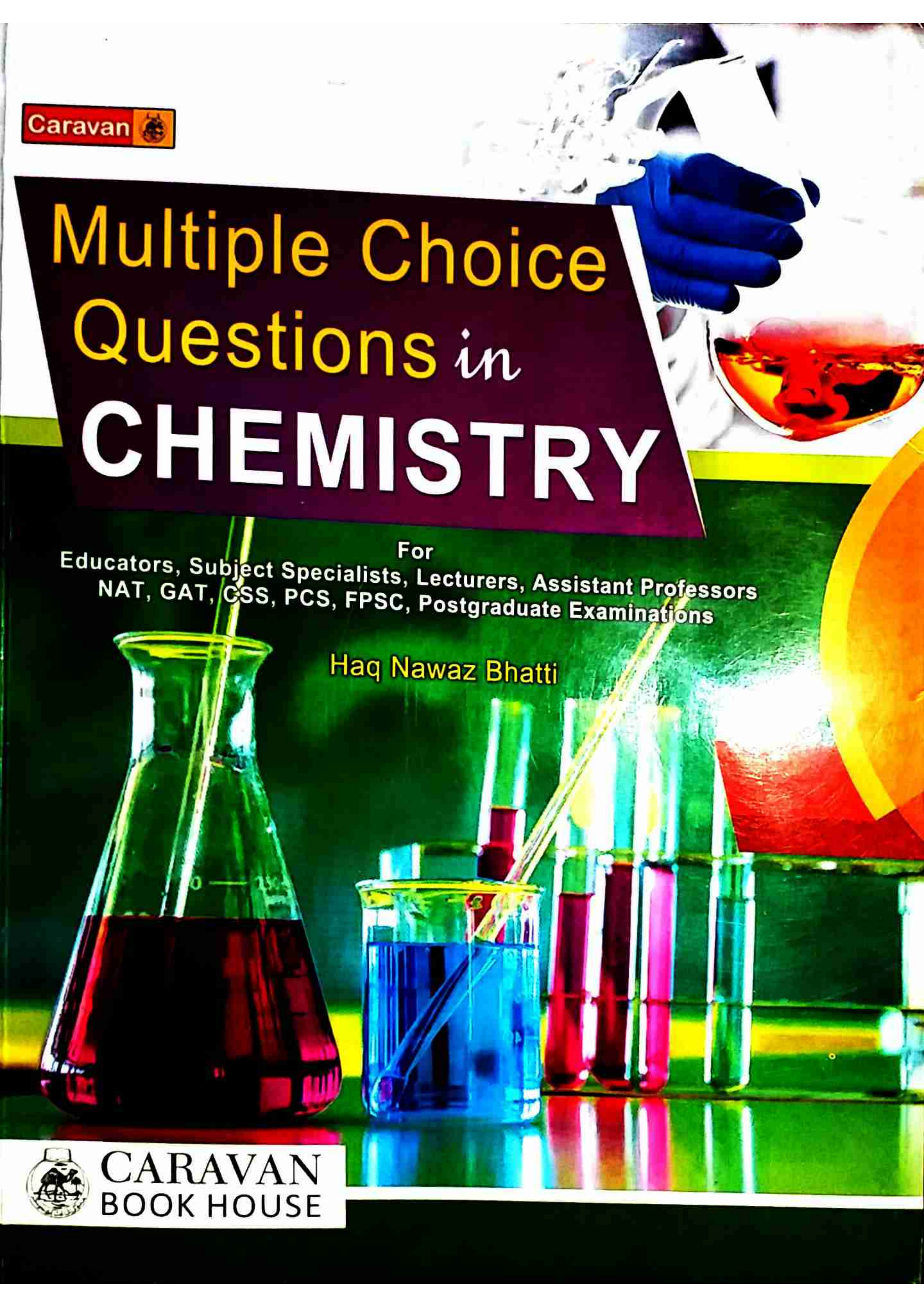

Caravan
Multiple Choice Questions in
CHEMISTRY
For
Educators, Subject Specialists, Lecturers, Assistant Professors
NAT, GAT, CSS, PCS, FPSC, Postgraduate Examinations
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CARAVAN
BOOK HOUSE

CONTENTS

1.1. BASIC CONCEPTS OF PHYSICAL CHEMISTRY

1. The study of various laws and principles governing chemical and physical changes is known as
   (A) Analytical chemistry.
   (B) Inorganic chemistry.
   (C) Organic Chemistry.
   (D) Physical Chemistry.

2. Which of the following is not element?
   (A) Silica (B) Graphite
   (C) Diamond
   (D) Plastic sulphur

3. The most abundant element in earth,s crust is
   (A) Oxygen (B) Nitrogen
   (C) Iron (D) Aluminium

4. Which of the following statements is correct?
   (A) Air is a homogenous mixture
   (B) A mixture is always heterogenous
   (C) All elements are heterogenous
   (D) Compounds made up of a number of elements are heterogeneous

5. Which of the following processes results in a chemical change?
   (A) Heating of a platinum rod.
   (B) Heating of iron rod.
   (C) Sublimation of ammonium chloride.
   (D) Dissolving of common salt in water.

6. Which of the following is not a mixture?
   (A) Gasoline
   (B) Distilled water.
   (C) Iodized table salt.
   (D) Sugar dissolved in water.

7. Which of the following statements is false?
   (A) Milk is a homogenous mixture.
   (B) Homogenous mixtures are called solutions.
   (C) An element of a substance contains only one kind of atoms,
   (D) A compound can be decomposed into its constituents.

8. A mixture of sand and ammonium chloride can be separated by
   (A) Chromatography.
   (B) Gravity separation.
   (C) Fractional crystallization.
   (D) Sublimation.

9. Calcium sulphate containing sodium sulphate as impurity is separated by
   (A) Filteration and crystallization
   (B) Chromatography.
   (C) Fractional crystallization.
   (D) Sublimation.

10. Which of the following is not a compound?
    (A) Ozone
    (B) Marble.
    (C) Carborundum.
    (D) Quick lime.

11. Which of the following is incorrect with respect to SI units?
    (A) Density in kg/m^3
    (B) Force in Newton,s.
    (C) Pressure in pascal,s
    (D) Amount of substance in mol/L

12. Which of the following is correct?
    (A) $1 dm^3 = 10^3 cm^3$
    (B) $1 L = 10 dm^3$ (C) $1 dm^3 = 10 L$
    (D) $1 L = 1 m^3$

13. The relationship between picometer (pm) and nanometer (nm) is
(A) 1 pm = 10 nm (B) 1 nm =10 pm
(C) 1 pm = 100 nm
(D) 1 nm = 100 pm

14. The atmospheric pressure of one torr is equal to
(A) 1 cm of Hg (B) 1 atm pressure
(C) 1m of Hg (D) 1 mm of Hg

15. Which of the following liquid mixture cannot be separated by simple distillation?
(A) Benzene and toluene
(B) Water and ethanol
(C) Acetone and methanol
(D) Ethanol and methanol

16. The percentage of hydrogen water and hydrogen peroxide is 11.1 and 5.9 % respectively. These figures illustrate
(A) Avogadro's law
(B) Law of conservation of mass
(C) Law of definite proportion
(D) Law of multiple proportion

17. The balancing of chemical equation is based on
(A) Avogadro's law
(B) Law of conservation of mass
(C) Law of definite proportion
(D) Law of multiple proportion

18. Oxygen combines with two isotopes of carbon (C^{12} and C^{14}) to form two samples of carbon dioxide. The data illustrates
(A) Law of reciprocal proportions
(B) Law of conservation of mass
(C) Law of definite proportion
(D) None of these

19. Which of the following pairs of compound illustrate law of multiple proportions?
(A) CsOH, KOH (B) D_2O and H_2O
(C) Benzene and ethane
(D) KI and KCl

20. The atomic mass of an element is
(A) The actual mass of one atom of the element
(B) The average relative mass of different atoms of the element
(C) Much different from the mass number of the element
(D) The relative mass of an atom of the element

21. The isotopes of chlorine with mass number 35 and 37 exist in the ratio of
(A) 1:1 (B) 3:1
(C) 1:3 (D) 3:2

22. The correct value of Avogadro's number is
(A) 6.02342×10^{21}
(B) 6.024×10^{22} (C) 6.02252×10^{23}
(D) 6.6230×10^{-34}

23. One mole of the nitrogen gas is the volume of
(A) One litre of nitrogen at STP
(B) 22.4 litres of nitrogen at STP
(C) 14 litres of nitrogen at STP
(D) 7 litres of nitrogen at STP

24. Which of the following has maximum mass?
(A) 0.1 gram atom of nitrogen
(B) 0.1 mole of ammonia
(C) 6.022×10^{22} molecules of He gas
(D) 12 cm^3 of carbon dioxide

25. Total number of atoms present in 64 g of SO_2 is
(A) 6.02×10^{22} (B) 6.02×10^{23}
(C) $64 \times 6.02 \times 10^{23}$
(D) $64 \times 6.02 \times 10^{22}$

26. The mass of one a.m.u. is approximately
(A) 1.0 g (B) 2.0 g
(C) 1.66×10^{24} g (D) 1.66×10^{-24} g

27. Which of the following represents 1 gram molecule of a substance?
(A) 6.02×10^{24} molecules of ammonia
(B) 4 gram of He

(C) 40 gram of CaO
(D) 127 gram of iodine

28. Equal volumes of different gases at any definite temperature and pressure have
(A) Equal masses (B) Equal atoms
(C) Equal molecules
(D) Equal densities

29. The equivalent mass of $KMnO_4$ in acidic medium is (K = 39, Mn = 55, O = 16)
(A) 158 (B) 15.8
(C) 31.6 (D) 3.16

30. The weights of two elements which combine with one another are in the ratio of their
(A) Atomic mass
(B) Molecular mass
(C) Equivalent mass
(D) Gram mole

31. The number of moles of SO_2 in 6.4 gram is
(A) 0.1 (B) 0.2
(C) 0.01 (D) 0.02

32. The empirical formula of oxalic acid is
(A) CHO (B) CH_2O
(C) CHO_2 (D) CH_2O_2

33. A sample in the ionization chamber of mass spectrometer is ionized by
(A) Electrons (B) Protons
(C) Neutrons (D) Nucleus

34. Which of the following will form single peak in mass spectrograph?
(A) Iodine (B) Arsenic
(C) Fluorine (D) All of these

35. Which one of the following contains maximum number of molecules?
(A) 16 gram methane
(B) 16 gram water
(C) 16 gram oxygen
(D) 16 gram sulphur dioxide

36. Actual yield of a chemical reaction is always less than the theoretical yield because of
(A) Reversible reactions
(B) Side reactions
(C) By product formation
(D) All of these

37. The number of peaks obtained in mass spectrometry shows
(A) Charge on isotopes
(B) Mass of isotopes
(C) Number of isotopes
(D) Relative abundance of isotopes

38. Which of the following substances is used as CO_2 absorber in combustion analysis?
(A) Lime water (B) Dilute NaOH
(C) 50% KOH (D) $Mg(OH)_2$

39. Which of the following properties is always in whole numbers?
(A) Atomic mass (B) Atomic radius
(C) Atomic volume
(D) Atomic number

40. The technique used to separate insoluble particles from liquid is:
(A) Sublimation (B) Crystallization
(C) Filtration
(D) Solvent extraction

41. The process controlled by distribution law is
(A) Sublimation (B) Crystallization
(C) Filtration
(D) Solvent extraction

42. Mixture of NaCl and ammonium chloride is separated by
(A) Sublimation (B) Crystallization
(C) Filtration
(D) Solvent extraction

43. Which of the following substance is used as decolorizing agent?
(A) Silica gel
(B) Animal charcoal
(C) Asbestos (D) Sulphuric acid

44. Which of the following is not used as drying agent in desiccators?
(A) NaCl solution (B) $CaCl_2$
(C) P_2O_5 (D) Silica gel

45. The separation of miscible liquids by heating due to difference in boiling points is called
(A) Vaporization (B) Distillation
(C) Sublimation (D) Condensation

46. The component which shows maximum affinity towards stationary state will have
(A) Large R_f value (B) Small R_f value
(C) Intermediate R_f value
(D) None of the above

47. Which of the following is not locating reagent?
(A) CS_2 (B) Rubeanic acid
(C) H_2S (D) Ninhydrin

48. Safe and most reliable method of drying crystals is:
(A) Furnace (B) Desiccator
(C) Oven
(D) None of the above

49. The most suitable locating reagent for amino acids on paper chromatography is
(A) Sulphuric acid (B) Rubeanic acid
(C) H_2S (D) Ninhydrin

50. The solid which is left over the filter paper is called
(A) Filtrate (B) Residue
(C) Crystals (D) Aliquot

ANSWERS

1. D	2. A	3. A	4. A
5. B	6. B	7. A	8. D
9. A	10. A	11. D	12. A
13. D	14. D	15. B	16. D
17. B	18. D	19. C	20. B
21. B	22. C	23. D	24. D
25. B	26. D	27. B	28. C
29. C	30. C	31. A	32. C
33. A	34. D	35. A	36. D
37. C	38. C	39. D	40. C
41. D	42. A	43. B	44. A
45. B	46. B	47. A	48. B
49. A	50. B		

1.2. ATOMIC STRUCTURE AND QUANTUM CHEMISTRY

1. Which of the following properties are not related to cathode rays?
   (A) These travel in a straight line.
   (B) These are deflected by magnetic and electric fields.
   (C) These rays can carry energy
   (D) These are dependent of the material used for the electrode.

2. Which of the following properties are not related to an atom?
   (A) An atom consists of two basic parts, a nucleus and one or more electrons.
   (B) The nucleus is the central core of an atom.
   (C) An electron is a heavy and negatively charged particle.
   (D) The nucleus itself consists of two particles.

3. Which color has minimum energy?
   (A) Green (B) Blue
   (C) Red (D) Yellow

4. Which element has same number of neutron as in $_{16}S^{32}$?
   (A) $_{11}Na^{23}$ (B) $_{12}Mg^{24}$
   (C) $_{15}P^{31}$ (D) $_{14}S^{28}$

5. Which of the following statements is not related to Rutherford observation about structure of an atom?
   (A) An atom consists of central core or nucleus around which the protons exist.
   (B) The nucleus has most of the mass of the atom.
   (C) The nucleus consists of protons and neutrons.
   (D) Each distinct atom has a specific number of protons.

6. A specific isotope has an atomic number of 18 and a mass number of 35. How many electrons are there in the neutral atom?
   (A) 34 (B) 18
   (C) 17 (D) 35

7. Which of the following pairs of fundamental particles are present in equal numbers in a neutral atom?
   (A) Proton and neutron
   (B) Proton and positron
   (C) Electron and negatron
   (D) Electron and proton

8. Which of the following determines the position of an element in the periodic table?
   (A) Chemical reactivity
   (B) Ionization potential
   (C) No. of protons in the nucleus
   (D) No of electrons in the outer orbital

9. Visible light is just a portion of radiation emitted by atoms. Which of the following statements is not related with visible light?
   (A) Visible light is electromagnetic in nature.
   (B) It travels with the speed of light.
   (C) The wave number of light is directly proportional to its wave length.
   (D) The range of visible light is 400 – 780 nm.

10. Which of the following relations between wave number ($\bar{\nu}$), frequency (ν) and speed is correct?
   (A) $\bar{\nu} = \frac{c}{\nu}$ (B) $\bar{\nu} = \frac{\lambda}{c}$
   (C) $\bar{\nu} = \frac{\nu}{c}$ (D) $\bar{\nu} = \frac{c}{\lambda}$

11. Which is the correct order of wave number of the following radiations?
   (A) X-rays > UV > infrared > visible
   (B) X-rays > UV > visible > infrared
   (C) X-rays > UV > radio waves > visible
   (D) X-rays > radio waves > UV > visible

12. Which of the following statements is not correct regarding electromagnetic radiation?
   (A) The frequency of microwave is less than UV.
   (B) The velocity of X-rays is more than UV.
   (C) The frequency of UV is greater than visible rays.
   (D) All radiations have same velocity.

13. Which particle has the longest wavelength if they have same speed?
   (A) Electron. (B) Proton
   (C) Alpha-particle (D) Neutron.

14. Which of the following statements is not relevant to the Plank's Quantum Theory?
   (A) Radiant energy is not absorbed or emitted continuously.
   (B) Radiant energy is emitted or absorbed in the form of small packets of energy.
   (C) The quantum of light energy is called photon.
   (D) The energy associated with photon of radiation is directly proportional to the wavelength.

15. Which of the following phenomena, is not explained by the classical mechanics?
   (A) Blackbody radiation
   (B) Photoelectric effect
   (C) Atomic and molecular spectra
   (D) All of the above

16. Particles in the cathode rays have same charge to mass ratio as
   (A) Protons
   (B) Gamma-rays.
   (C) Alpha-particles
   (D) Beta-particles.

17. Which of the following is never true for cathode rays?
   (A) They are electromagnetic rays
   (B) They possess kinetic energy
   (C) They produce heat
   (D) They produce mechanical pressure

18. Millikan's oil drop experiment is used to find
   (A) e/m ratio of electron
   (B) Mass of electron
   (C) Velocity of electron
   (D) Charge on the electron

19. Which of the following statements is correct?
   (A) Isotopes have same number of neutrons
   (B) Isobars have same number of neutrons
   (C) Iostones have same number of protons.
   (D) Isobars are atoms of different elements

20. Rutherford's scattering experiment is related to the size of
   (A) Nucleus (B) Atom
   (C) Electron (D) Proton

21. Which of the following spectral series lies in the visible region of the spectrum?
   (A) Balmer series (B) Paschen series
   (C) Pfund series (D) Bracket series

22. Which of the following expressions represent the de-Broglie equation?
   (A) $\lambda = \frac{mv}{h}$ (B) $h = \frac{mv}{\lambda}$
   (C) $\lambda = \frac{h}{mv}$ (D) $\lambda = hv$

23. The branch of Science that mathematically describes the wave

properties of electron in atoms is called
(A) Statistical Mechanics
(B) Quantum Mechanics
(C) Chemical Statistics
(D) Thermodynamics

24. Which of the following expressions represent Heisenberg's uncertainty principle?
(A) $\Delta x \cdot \Delta p < h/2\pi$ (B) $\Delta x \cdot \Delta v < h/4\pi$
(C) $\Delta x \cdot \Delta p \geq h/4\pi$ (D) $\Delta x \cdot \Delta p = h/2\pi$

25. Heisenberg's uncertainty principle precludes the exact simultaneous measurement of
(A) Velocity and energy
(B) Velocity and time
(C) Charge density and probability
(D) Position and momentum

26. The principal quantum number determines which property of the orbital
(A) Energy
(B) Energy and size
(C) Size (D) Shape

27. The azimuthal or angular quantum number (l) determines which property of the orbital
(A) Energy
(B) Energy and size
(C) Size (D) Shape

28. The magnetic quantum number (m) determines which property of the orbital
(A) Energy (B) Spin
(C) Orientation (D) Shape

29. The magnitude of spin angular momentum of an electron is
(A) $\sqrt{s} \cdot \frac{h}{2\pi}$ (B) $\sqrt{s+1} \cdot \frac{h}{2\pi}$
(C) $\sqrt{s(s+1)} \cdot \frac{h}{2\pi}$ (D) $\sqrt{s(s+1)} \cdot \frac{h}{\pi}$

30. The increasing order of energies of various sub-shells is
(A) 1s < 2s < 3s < 2p < 3p < 4s < 3d
(B) 1s < 2s < 2p < 3s < 3p < 4s < 3d
(C) 1s > 2s > 2p > 3s > 3p > 4s > 3d
(D) 1s < 2s < 2p < 3s < 3p < 3d < 4s

31. The electron in K shell of the atom will differ in
(A) Principle quantum number
(B) Spin quantum number
(C) Magnetic quantum number
(D) Azimuthal quantum number

32. Which of the following conditions is incorrect for well behaved functions (ψ)?
(A) ψ must be finite
(B) ψ must be normalized
(C) ψ must be single valued at any particular point.
(D) ψ must be positive

33. Which of the following orbital is not possible?
(A) 3p (B) 4s
(C) 2d (D) 1s

34. The maximum number of electrons in first energy level is
(A) 18 (B) 1
(C) 8 (D) 2

35. If the principal quantum number n = 4, the quantum number l can have values
(A) 1, 2, 3 and 4 (B) 0, 1, 2 and 3
(C) 1, 2 and 3 only (D) 0, ±1, ±2, ±3

36. The SI units of wave number is
(A) Cycle per second
(B) m^{-1} (C) Second
(D) cm

37. An orbital can accommodate maximum of
(A) 1 electron (B) 2 electron
(C) 3 electron (D) 4 electron

38. Which of the following orbital does not make sense?
(A) 6f (B) 4f
(C) 7s (D) 5g

39. The maximum number of electrons in s, p, d and f sub-shells is
(A) 2 in each (B) 2, 6, 10, 18
(C) 2, 6, 10, 14 (D) 4, 6, 10, 10

40. de-Broglie's equation treats electron two be
(A) A particle (B) A wave
(C) Both (D) None of above

41. Atomic emission spectra of an element cannot be used to
(A) Identify the element
(B) Determine the mass
(C) Calculate the ionization energy
(D) Determine the number of proton

42. Which of the following orbital will be filled first?
(A) 4f (B) 5d
(C) 3d (D) 4s

43. The atomic orbitals are progressively filled in order of increasing energy. This statement is called as
(A) Hund's rule (B) Aufbau's rule
(C) $(n + l)$ rule
(D) Pauli exclusion principle

44. The electronic configuration of chromium (Z = 24) in the ground state is
(A) [Ar] $4s^2$, $3d^4$ (B) [Ar] $3d^6$
(C) [Ar] $4s^1$, $3d^5$ (D) [Ar] $4s^2$, $3d^1$

45. Which is the correct configuration of Fe^{3+} (Z = 26)?
(A) [Ar] $4s^2$, $3d^6$ (B) [Ar] $4s^2$, $4d^5$
(C) [Ar] $3d^5$ (D) [Ar] $4s^2$, $3d^3$

46. Zero point energy of an electron in one-dimensional box is given by
(A) $E = n^2h^2/8ma^2$ (B) $E = 2h^2/8ma^2$
(C) $E = h^2/8ma^2$ (D) $E = h/8ma^2$

47. An electron in an atom or molecule can jump from lower level to higher level. The wavelength of light absorbed is related to the energy gap between two levels by following expression
(A) $\Delta E = hk$ (B) $\Delta E = hc/v$
(C) $\Delta E = hc/\lambda$ (D) $ch = \Delta E$

48. Which of the following operator/function combinations would yield an eign value equation?
(A) d/dx (sin x) (B) d/dx (cos x)
(C) d/dx (sin 4x) (D) d/dx (e^x)

49. The lowest K.E. for an electron is three-dimensional cubic box is given by
(A) $h^2/8ma^2$ (B) $3h^2/8ma^2$
(C) $9h^2/8ma^2$ (D) $6h^2/8ma^2$

50. The degree of degeneracy of the energy level $17h^2/8ma^2$ of a particle in a cubic box is
(A) 5-fold (B) 2-fold
(C) 6-fold (D) 3-fold

51. Which of the following statements is not related to VBT?
(A) It treats the bond as purely ionic
(B) VBT uses the concept of resonance
(C) VBT does not explain the paramagnetic nature of molecule
(D) It uses only valance electron

52. Which of the following statements is not related to MOT?
(A) Atomic orbitals lose their identities
(B) MOT gives an idea of delocalization
(C) MOT uses all the orbitals and electrons
(D) It treats bonds as purely covalent

53. Which of the following particles has maximum charge to mass ratio?
(A) Electron (B) Neutron
(C) Proton (D) Alpha-particles

54. The Schrodinger equation when solved for any system gives
(A) The mean force path
(B) The polarizability
(C) The energy function
(D) The wave function

55. C^{13} and C^{14} are
(A) Isotopes (B) Isotones
(C) Isobars (D) Isomers

56. The heaviest sub-atomic particle is
(A) Proton (B) Neutron
(C) Electron (D) Meson

57. Rutherford's model of the atom accounts for the
(A) Scattering of alpha-particles by metal foils
(B) Stability of the electronic orbits
(C) Stability of the atom
(D) Line spectra of the light elements

58. Bohr,s model could explain successfully
(A) The spectrum of He
(B) The spectrum of species containing one electron only
(C) Spectrum of multi-electron atoms
(D) The spectrum of hydrogen molecule

59. The concept of dual nature of radiation was introduced by
(A) E. Schrodinger (B) A. Einstein
(C) G. Bell (D) de-Broglie

60. Energy of photon is inversely proportional to
(A) Wave length (B) Frequency
(C) Wave number (D) None of above

ANSWERS

1. D	2. C	3. C	4. C
5. A	6. B	7. D	8. C
9. C	10. C	11. B	12. B
13. A	14. D	15. D	16. D
17. A	18. D	19. D	20. A
21. A	22. C	23. B	24. D
25. D	26. B	27. D	28. C
29. C	30. B	31. B	32. D
33. C	34. D	35. B	36. B
37. B	38. D	39. C	40. C
41. B	42. D	43. B	44. C
45. C	46. C	47. C	48. D
49. B	50. D	51. A	52. D
53. A	54. D	55. A	56. B
57. A	58. B	59. B	60. A

1.3. GASES, LIQUIDS AND SOLIDS

1. Which of the following statements is not related to the characteristics of a gaseous state?
   (A) The intermolecular forces of attraction are not strong in gaseous state
   (B) The gases do not have definite shape and volume
   (C) The gases are characterized by low density
   (D) The gases have low compressibility

2. The SI unit of pressure is Pascal (Pa). It is defined as a force per unit area of $1N/m^2$. One atmosphere of pressure is equal to
   (A) 760 mm of Hg (B) 1 bar
   (C) 101 kPa (D) All are correct

3. The volume of a given mass of gas at constant temperature varies inversely with the pressure. This is a statement of
   (A) Charles's law (B) Avogadro's law
   (C) Boyle's law (D) Dalton's law

4. The volume of a given mass of a gas at constant pressure is directly proportional to the absolute temperature. This is a statement of
   (A) Charles's law (B) Boyle's law
   (C) Avogadro's law (D) Dalton's law

5. Equal volumes of all gases, under similar conditions of temperature and pressure, contain equal number of molecules. This is a statement of
   (A) Graham's law (B) Dalton's law
   (C) Avogadro's law (D) Charles's law

6. At constant temperature and pressure, the rates of effusion of various gases vary inversely as square root of their densities. This is a statement of
   (A) Boyle's law (B) Charles's law
   (C) Avogadro's law (D) Graham's law

7. Total pressure exerted by a mixture of two or more than two gases in a definite volume, at any given temperature is equal to the sum of partial pressures which each gas would exert, if it occupied the same volume alone, at the same temperature. This is a statement of
   (A) Boyle's law (B) Charles's law
   (C) Graham's law (D) Dalton's law

8. For a given mass of a gas if temperature increase
   (A) Pressure and volume remain constant
   (B) Volume increases provided pressure is kept constant
   (C) Pressure decreases provided volume is constant
   (D) Volume decreases provided pressure is constant

9. Which of the following statements is not correct regarding the constant R and in ideal gas equation PV = nRT?
   (A) Its value is independent of temperature
   (B) Its value is independent of pressure
   (C) Its value is dependent of nature of gas
   (D) It is called the universal gas constant

10. For a given mass of a gas at constant temperature, if the value V becomes 3 times, the pressure will become
    (A) 3P (B) P/3
    (C) 6P (D) 9P

11. Which of the following has least critical temperature?
(A) CO_2 (B) H_2O
(C) O_2 (D) NH_3

12. The gases H_2, N_2, O_2 and NH_3 (molecular masses, $H_2 = 2$, $N_2 = 28$, $O_2 = 32$, and $NH_3 = 17$) will effuse in the order
(A) $H_2 > N_2 > O_2 > NH_3$
(B) $NH_3 > O_2 > N_2 > H_2$
(C) $H_2 > N_2 > NH_3 > O_2$
(D) $H_2 > NH_3 > N_2 > O_2$

13. Which of the following is not a correct postulate of the kinetic theory of gases?
(A) The molecules are in random motion
(B) The gaseous collisions are perfectly elastic
(C) The gas molecule have no repulsive forces
(D) The pressure exerted on the walls of the container is due to intermolecular forces

14. For one mole of a gas, the total kinetic energy is equal to
(A) 2/3 RT (B) 3/2 RT
(C) 2/3 kT (D) 3/2 kT

15. Which of the following equations correctly represents the van der Waals equation?
(A) $\left(p - \frac{an^2}{v^2}\right)(v - nb) = nRT$
(B) $\left(p + \frac{a^2n}{v}\right)(v - nb) = nRT$
(C) $\left(p + \frac{an^2}{v^2}\right)(v - nb) = nRT$
(D) $\left(p - \frac{an^2}{v}\right)(v - nb) = nRT$

16. A gas obeying the van der Waals equation will closely resemble an ideal gas if
(A) The parameters 'a' and 'b' are small
(B) 'a' is small but 'b' is large
(C) 'a' is large but 'b' is small
(D) Both 'a' and 'b' are large

17. At extremely low pressures, the van der Waals equations for one mole may be written as
(A) PV = RT + Pb (B) PV = RT
(C) PV = RT – a/V
(D) (P + a) (V – b) = RT

18. The value of compressibility factor $(z) = \frac{pV}{nRT}$ for an ideal gas is equal to
(A) R (B) 2
(C) 1 (D) 1.5

19. The number of coordinates required to specify the position of all the atoms in a molecule is called number of degree of freedom. The vibrational degrees of freedom of a linear molecule containing N atoms are
(A) 2N – 5 (B) 2N – 6
(C) 3N – 6 (D) 3N – 5

20. The vibrational degrees of freedom of a non-linear molecules containing N atoms are equal to
(A) 2N – 6 (B) 3N – 6
(C) 3N – 5 (D) 2N – 5

21. The correct expression for root mean square speed is
(A) $\sqrt{2RT/M}$ (B) $\sqrt{\frac{3RT}{M}}$
(C) $\sqrt{\frac{8RT}{M}}$ (D) $\sqrt{\frac{8RT}{\pi M}}$

22. Which of the following expressions does not represent the root mean square velocity?
(A) $\sqrt{\frac{3RT}{M}}$ (B) $1.732\sqrt{\frac{RT}{M}}$
(C) $\sqrt{\frac{3PV}{M}}$ (D) $\sqrt{\frac{2RT}{M}}$

23. The relationship between most probable, root mean square and average velocity is given by
(A) $\bar{C} > C_{rms} > C_{mp}$
(B) $\bar{C} > C_{mp} > C_{rms}$
(C) $C_{rms} > \bar{C} > C_{mp}$
(D) $C_{mp} > C_{rms} > \bar{C}$

24. The reciprocal of the coefficient of viscosity is called
(A) Density (B) Specific gravity
(C) Fluidity (D) Conductance

25. The temperature of a gas below which only the gas cools when allowed to expand is known as
(A) Inversion temperature
(B) Ideal temperature
(C) Critical temperature
(D) Joule-Thomson temperature

26. An ideal gas is one which obeys all the gas laws at
(A) Low pressure (B) High pressure
(C) Low temperature
(D) All conditions of pressure and temperature

27. The correct expression for average speed is
(A) $\sqrt{2RT/M}$ (B) $\sqrt{\frac{3RT}{M}}$
(C) $\sqrt{\frac{8RT}{M}}$ (D) $\sqrt{\frac{8RT}{\pi M}}$

28. The velocity possessed by maximum fraction of molecules at a given temperature is called
(A) Average velocity
(B) Root mean square velocity
(C) Most probable velocity
(D) Diffusion velocity

29. Which of the following equation is the most general equation of state?
(A) Vander Waal's equation
(B) Dicterici equation
(C) Clasusius equation
(D) Kamberling Onnes equation

30. The correct expression for most probable speed is
(A) $\sqrt{2RT/M}$ (B) $\sqrt{\frac{3RT}{M}}$
(C) $\sqrt{\frac{8RT}{M}}$ (D) $\sqrt{\frac{8RT}{\pi M}}$

31. Rates of effusion of H and D under similar conditions are in the ratio
(A) 2 : 1 (B) $\sqrt{2}$: 1
(C) 1 : 4 (D) 1 : 1

32. The root mean square velocity of an ideal gas at constant pressure varies with density as
(A) d^2 (B) d
(C) $d^{1/2}$ (D) $1/d^{1/2}$

33. Which of the folliwng has maximum root mean square velocity at 25°C?
(A) CO_2 (B) SO_2
(C) NH_3 (D) H_2S

34. Which of the following deviates most from ideal behavoiur?
(A) N_2 (B) He
(C) CH_4 (D) HCl

35. Which of the following molecules have maximum root mean square velocity?
(A) CO_2 (B) SO_2
(C) NH_3 (D) H_2S

36. Lind's method is employed for
(A) Expansion of gases
(B) Separation of gases
(C) Compression of gases
(D) Liquefaction of gases

37. The highest temperature at which a substance can exist as a liquid is called
(A) Critical temperature
(B) Transition temperature
(C) Absolute temperature
(D) Standard temperature

38. The simplest form of matter is
(A) Plasma (B) Liquid
(C) Solid (D) Gas

39. The critical temperature of a gas depends upon
    (A) Size of molecules
    (B) Shape of molecules
    (C) Intermolecular forces
    (D) All these

40. Which of the following has low density at room temperature?
    (A) N_2 (B) Ne
    (C) NH_3 (D) CO_2

41. Which of the following gases diffuse more quickly than oxygen?
    (A) H_2S (B) NO
    (C) N_2O (D) Cl_2

42. Which of the following gases diffuse more rapidly?
    (A) Cl_2 (B) N_2
    (C) CH_4 (D) CO_2

43. Which of the following gases is more ideal at STP?
    (A) H_2 (B) H_2S
    (C) NH_3 (D) SO_2

44. Which of the following gases deviates from ideal behavior at high pressure?
    (A) H_2 (B) He
    (C) NH_3 (D) Ar

45. Under what conditions real gases deviate from ideal behavior
    (A) High pressure
    (B) High temperature
    (C) Low temperature
    (D) Low temperature and high pressure

46. The vapor pressure of a liquid
    (A) Always increases with temperature
    (B) Always decreases with temperature
    (C) Is independent of temperature
    (D) Remains constant at any temperature

47. Liquids diffuses slowly as compared to gases because
    (A) The molecules of liquids are heavy
    (B) The molecules of liquids are light
    (C) Liquids have no fixed shape
    (D) Mean free path of the molecules of liquids is very short

48. Which of the following property of liquids concerns with the interval resistance to its flow?
    (A) Refractive index
    (B) Optical activity (C) Viscosity
    (D) Surface tension

49. A drop of a liquid acquires spherical shape because of
    (A) Its viscous nature
    (B) Capillary action
    (C) Its tendency to acquire minimum surface area
    (D) Its tendency to acquire maximum surface area

50. Which of the following liquids has lowest vapor pressure at 25°C?
    (A) Benzene (B) Chloroform
    (C) Ether
    (D) Carbon tetrachloride

51. At higher altitudes, the boiling point of water is lowered because
    (A) Atmospheric pressure is low
    (B) Temperature is low at high altitude
    (C) Atmospheric pressure increases
    (D) Water solidifies to ice

52. The units of surface tension in SI system are
    (A) Joule m^{-1} (B) Newton m^{-1}
    (C) Erg cm^{-1} (D) Dynes cm^{-2}

53. The rise of a liquid in capillary tube is due to
    (A) Osmosis (B) Diffusion
    (C) Surface tension (D) Viscosity

54. In the drop-number method, if we take two liquids whose surface tension are γ_1 and γ_2, number of drops n_1 and n_2 and densities d_1 and d_2, then which of the following equation the correct one is

(A) $\frac{\gamma_1}{\gamma_2} = \frac{d_2 n_2}{d_1 n_1}$ (B) $\frac{\gamma_1}{\gamma_2} = \frac{d_2 n_1}{d_1 n_2}$

(C) $\frac{\gamma_1}{\gamma_2} = \frac{d_1 n_2}{d_2 n_1}$ (D) $\frac{\gamma_1}{\gamma_2} = \frac{d_1 n_1}{d_2 n_2}$

55. Which of the following device is used to measure the surface tension?
(A) Polarimeter (B) Viscometer
(C) Refractometer (D) Stalagmometer

56. Which of the following equations properly describes the relationship between surface tension, density and molar mass of a liquid?

(A) $\frac{M\gamma^{1/2}}{D} = [P]$ (B) $\frac{M\gamma^{1/3}}{D} = [P]$

(C) $\frac{M\gamma^{1/4}}{D} = [P]$ (D) $\frac{M\gamma^{1/5}}{D} = [P]$

57. The units of coefficient of viscosity are
(A) $kg\ m^{-1}\ s^{-1}$ (B) $g\ m^{-1}\ s^{-1}$
(C) $kg\ m^{-1}\ min^{-1}$ (D) $g\ m^{-1}\ min^{-1}$

58. A pressure cooker reduces time because
(A) Heat is uniformly distributed
(B) Boiling point of water increases
(C) A large flame is used
(D) Vapor pressure of the liquid decreases

59. The internal resistance to flow possessed by a liquid is called its
(A) Fluidity (B) Viscosity
(C) Turbidity
(D) Surface tension

60. The fore of friction (F) between two cylindrical layers each of 'A' cm^2 separated by 'l' cm having a velocity difference v ms^{-1} is given by

(A) $F = \eta Avl$ (B) $F = \eta \frac{A}{l}$

(C) $F = \eta \frac{lv}{A}$ (D) $F = \eta \frac{Av}{l}$

61. If η_1 and η_2 are the coefficient of viscosity of two liquids, d_1 and d_2 are their densities and t_1 and t_2 are times of flow, then

(A) $\frac{\eta_1}{\eta_2} = \frac{d_1 t_2}{d_2 t_1}$ (B) $\frac{\eta_1}{\eta_2} = \frac{d_2 t_2}{d_1 t_1}$

(C) $\frac{\eta_1}{\eta_2} = \frac{d_1 t_1}{d_2 t_2}$ (D) $\frac{\eta_1}{\eta_2} = \frac{d_2 t_1}{d_1 t_2}$

62. If η and η_o are the coefficients of viscosity of a solution and the pure solvent, then specific viscosity may be expressed as

(A) η/η_o (B) $\frac{\eta - \eta_o}{\eta_o}$

(C) $\frac{\eta_o - \eta}{\eta_o}$ (D) $\frac{1 + \eta}{1 - \eta_o}$

63. If n an d are the refractive index and density of a liquid and M molar mass, then molar refraction is defined as

(A) $R_M = \left(\frac{n^2 - 1}{n^2 + 2}\right)\frac{M}{d}$

(B) $R_M = \left(\frac{n - 1}{n^2 + 2}\right)\frac{M}{d}$

(C) $R_M = \left(\frac{n^3 - 1}{n^2 + 2}\right)\frac{d}{M}$

(D) $R_M = \left(\frac{n^2 + 2}{n^2 - 1}\right)\frac{M}{d}$

64. Which of the following instruments is used to measure the optical activity?
(A) Refractometer
(B) Conductivity meter
(C) Potentiometer (D) Polarimeter

65. The rotation of plane polarized light when it passes through 1 dm of a solution containing 1 gram of the

substance per cm^3 of the solution is called

(A) Molar rotation

(B) Molar refraction

(C) Specific refraction

(D) Specific rotation

66. If α is the angle of rotation, c is the concentration of the optically active substance and l is the path length of light, then specific rotation is defined as

(A) $\frac{l \times c}{\alpha}$ (B) $\frac{\alpha}{l \times c}$

(C) $\frac{2l}{c}$ (D) $\frac{l \times c}{2l}$

67. Which of the following compounds shows optical activity?

(A) Lactic acid (B) Sucrose

(C) Glucose (D) All above

68. Which of the following compounds does not show dipole moment?

(A) CH_3OH (B) HBr

(C) $CHCl_3$ (D) CCl_4

69. The intensity of magnetization produced per unit strength of the applied magnetic field is called magnetic susceptibility, which of the following statements is not related with this phenomenon?

(A) Confirmation of structure of given compound

(B) Distinction of different oxidation states

(C) Complex stereochemistry

(D) Diamagnetic nature of molecules

70. The rheochor is defined as the molar volume of the liquid at the temperature at which viscosity is unity. It is expressed as

(A) $\frac{d}{M} \times \eta^{1/8}$ (B) $\frac{M}{d} \times \eta^{1/4}$

(C) $\frac{M}{d} \times \eta^{1/5}$ (D) $\frac{d}{M} \times \eta^{1/4}$

71. If a liquid of density d rises in a capillary of radius r cm to a height of h cm and θ is the contact angle, then surface tension of the liquid is

(A) γ 2 $r h g \rho \cos\theta$

(B) $\gamma = \frac{2 \cos\theta}{r h g \rho}$ (C) $\gamma = \frac{r h g \rho}{2 \cos\theta}$

(D) $\gamma = \frac{1}{3} r h \rho g$

72. For associated liquids, the value of $\frac{d}{M} \eta \times 10^8$ should be (where d is the density, M is the molar mass and η is the coefficient of viscosity)

(A) Zero (B) Infinite

(C) Between 40 and 70

(D) Higher than 70

73. Poise is a unit of

(A) Refractive index

(B) Optical activity

(C) Fluidity (D) Viscosity

74. Which of the following liquids has higher vapour pressure?

(A) Ethanol (B) Ammonia

(C) Water (D) HF

75. The vapor pressure of the liquid depends on

(A) Amount of the liquid

(B) Temperature of the lquid

(C) Definite volume of the vessel

(D) Both amount and temperature

76. Rate of evaporation of a liquid depends upon

(A) Surface area of the liquid

(B) Temperature

(C) Intermolecular forces

(D) All above factors

77. Which of the following is not a characteristic of solids?

(A) Definite shape (B) Definite mass

(C) Definite volume

(D) Fluidity

78. The particle motion in solids is
(A) Only vibratory
(B) Only translatory
(C) vibratory and rotatory
(D) Vibratory and translatory

79. Which of the following is not a characteristics of crystalline solids?
(A) Sharp melting point
(B) Isotropy
(C) Long range orderly arrangement
(D) Anisotropic nature

80. Which of the following is an example of molecular solids?
(A) MgO (B) ZnO
(C) Graphite (D) Ice

81. Which type of the solids are generally good conductors of electricity?
(A) Covalent (B) Ionic
(C) Metallic (D) Molecular

82. Which of the following is not related to crystallography?
(A) Law of rational indices
(B) Law of symmetry
(C) Law of constancy of interfacial angle (D) Henry's law

83. A device which is used to measure the interfacial angle is known as
(A) Voltmeter (B) Potentiometer
(C) pH-meter (D) Goniometer

84. The angle between corresponding planes forming the external surfaces of the crystal remains constant for a given substances. This is known as
(A) Steno's law (B) Henry's law
(C) Bragg law (D) Pascal law

85. Which of the following unit cells has least symmetry?
(A) Monocline (B) Cubic
(C) Triclinic (D) Tetragonal

86. Among the unit cells given below, which has the highest symmetry?
(A) Monoclinic (B) Cubic
(C) Hexagonal (D) Orthorhombic

87. A unit cell having dimensions, $a = b = c$; $\alpha = \beta = \gamma = 90°$ is known as
(A) Cubic (B) Hexagonal
(C) Orthorhombic (D) Tetragonal

88. A unit cell having dimensions, $a = b = c$; $\alpha = \beta = \gamma \neq 90°$ is known as
(A) Cubic (B) Trigonal
(C) Tetragonal (D) Hexagonal

89. A unit cell having dimensions, $a = b \neq c$, $\alpha = \beta = 90°$, $\gamma = 120°$ is known as
(A) Hexagonal (B) Monoclinic
(C) Trigonal (D) Cubic

90. A unit cell having dimensions, $a \neq b \neq c$; $\alpha = \gamma = 90°$, $\beta \neq 90°$ is known as
(A) Trigonal (B) Cubic
(C) Monoclinic (D) Hexagonal

91. Which of the following has hexagonal structure?
(A) Sodium chloride
(B) Potassium chloride
(C) Diamond (D) Graphite

92. Which of the following has cubic structure?
(A) Sodium chloride
(B) Potassium chloride
(C) Diamond (D) All of above

93. The total number of crystal systems and the number of Bravais lattices are
(A) 7, 7 (B) 14, 7
(C) 7, 14 (D) 14, 28

94. Out of seven crystal system, how many can have body centered unit cell?
(A) 4 (B) 3
(C) 2 (D) 7

95. The coordination number of atoms in a hexagonal closed packed structure is
(A) 2 (B) 6
(C) 4 (D) 12

96. Which of the following statements is incorrect about rock salt type?
(A) It has fcc arrangement of Na^+

(B) Na^+ and Cl^- ions have coordination number of 6 : 6
(C) A unit cell of NaCl consists of four NaCl units
(D) All halides of alkali metals have rock salt-type structure

97. Which of the following type of lattice has maximum number of atoms per unit cell?
(A) Simple cubic
(B) Body centred cubic
(C) Face centred cubic
(D) End centred cubic

98. The phenomenon of X-ray diffraction was studied by
(A) Huygen (B) Bragg
(C) Max Planck (D) Becquerel

99. When Si is dipped with As, it becomes
(A) Superconductor
(B) An-insulator
(C) P-type semiconductor
(D) N-type semiconductor

100. The addition of As to Ge makes the latter a
(A) Metallic conductor
(B) Ionic conductor
(C) Intrinsic conductor
(D) Extrinsic semiconductor

101. For a cubic system, the interplanar distance 'd' is related to the unit dimension 'a' and the Miller indices hkl by the relation

(A) $d_{hkl} = \frac{a}{h + k + l}$

(B) $d_{hkl} = \frac{a^2}{h^2 + k^2 + l^2}$

(C) $d_{hkl} = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$

(D) $d_{hkl} = \frac{a^2}{\sqrt{h^2 + k^2 + l^2}}$

102. Brass is an alloy of
(A) Copper and tin
(B) Copper and zinc
(C) Aluminium and nickel
(D) Leed and tin

103. The height to which a liquid will rise in an open capillary tube is inversely proportional to
(A) Temperature of the liquid
(B) Surface tension
(C) Density of the liquid
(D) Air pressure

104. Layer of C-atom in graphite are held together by
(A) Covalent bonds
(B) Free electrons (C) Ionic bonds
(D) Van der Waals forces

105. Which of the following is not true for metalloids?
(A) They are borderline elements
(B) They usually act as electron donors with non-metals
(C) B, Si and Ge
(D) They are all solids at room temperature

106. Which substance has the greatest lattice energy?
(A) CuBr (B) MgO
(C) KI^- (D) NaF

107. Which of the following regions of the spectrum would be used to determine the structure of the crystalline solids?
(A) Microwave (B) X-rays
(C) Visible (D) Infrared

108. Which of the following should have the largest dipole moment?
(A) Cis-stilbene (B) Trans-stilbene
(C) Cis-dichloroethylene
(D) Tráns-dichloroethylene

109. The number of vibrational degrees of freedom for CO_2 is
(A) 3 (B) 2
(C) 4 (D) 9

110. Which of the following has the highest lattice energy?
(A) NaCl (B) LiCl
(C) KCl (D) RbCl

111. The particles would be stationary in a lattice only at
(A) 273K (B) 0K
(C) 298K (D) 373K

112. In sodium chloride type lattice, the ratio of coordination number of cation to anion is
(A) 8 : 8 (B) 6 : 6
(C) 4 : 8 (D) 8 : 4

113. In graphite lattice, what is the number of nearest neighbours for each carbon atom?
(A) 6 (B) 5
(C) 4 (D) 3

114. Which of the following elements exists as discrete small molecules in the solid state?
(A) Sodium (B) Iodine
(C) Silicon (D) Aluminium

115. Which of the following solids is an example of substance with macromolecular structure?
(A) $AlCl_3$ (B) SiO_2
(C) MgO (D) Ice

116. Which solid does not contain covalent bond?
(A) Cu (B) Ice
(C) Diamond (D) Graphite

117. Glass is
(A) Amorphous solid
(B) Vitreous solid
(C) Supercooled liquid
(D) All correct

118. Nature of iodine crystals is
(A) Metallic (B) Ionic
(C) Covalent (D) Molecular

119. Which of the folloiwng does not show hydrogen bonding?
(A) Water (B) Phenol
(C) Ethanol (D) Ether

120. Bucky balls is an allotropic form of
(A) Sulphur (B) Silica
(C) Tin (D) Carbon

121. Which of the following substances has amorphous nature?
(A) Glass (B) Plastic
(C) Waxes (D) All

122. Coordination number of Cs in CsCl is
(A) 2 (B) 8
(C) 6 (D) 4

ANSWERS

1. D	2. D	3. C	4. A
5. C	6. D	7. D	8. B
9. C	10. B	11. C	12. D
13. D	14. B	15. C	16. A
17. B	18. C	19. D	20. B
21. B	22. D	23. C	24. C
25. C	26. D	27. D	28. C
29. D	30. A	31. B	32. A
33. C	34. D	35. C	36. D
37. A	38. D	39. D	40. C
41. B	42. C	43. A	44. C
45. D	46. A	47. D	48. C
49. C	50. D	51. A	52. B
53. C	54. C	55. D	56. C
57. A	58. B	59. B	60. D
61. C	62. B	63. A	64. D
65. D	66. B	67. D	68. D
69. D	70. C	71. C	72. D
73. D	74. B	75. B	76. D
77. D	78. D	79. B	80. D
81. C	82. D	83. D	84. A
85. C	86. B	87. A	88. B
89. A	90. C	91. D	92. D
93. C	94. B	95. D	96. D
97. C	98. B	99. D	100. D
101. C	102. B	103. C	104. D
105. B	106. B	107. B	108. C
109. C	110. B	111. B	112. B
113. D	114. B	115. B	116. A
117. D	118. D	119. D	120. D
121. D	122. B		

1.4. CLASSICAL AND STATISTICAL THERMODYNAMICS

1. Branch of chemistry that deals with the basic principles governing energy changes during various processes is called
(A) Wave mechanics
(B) Chemical kinetics
(C) Chemical thermodynamics
(D) Electrochemistry

2. A system which can exchange energy as well as matter with its surroundings is said to be a/an
(A) Closed system (B) Inert system
(C) Open system
(D) Isolated system

3. A closed system is one which can exchange, with surroundings
(A) Matter but not energy
(B) Energy but not matter
(C) Both matter and energy
(D) Neither matter nor energy

4. Any property whose magnitude is independent of the amount of substance present is called a/an
(A) Extensive property
(B) Colligative property
(C) Structural property
(D) Intensive property

5. Which of the following is not an extensive property?
(A) Work (B) Entropy
(C) Free energy (D) Volume

6. Which of the following is not an intensive property?
(A) Melting point
(B) Refractive index
(C) Specific gravity
(D) Entropy

7. A process in which no heat enters or leaves the system is called
(A) Isochoric (B) Isobaric
(C) Isothermal (D) Adiabatic

8. In an isochoric process
(A) Energy remains constant
(B) Volume remains constant
(C) Pressure remains constant
(D) Temperature remains constat

9. ΔH and ΔE are related as
(A) $\Delta E = \Delta H + P\Delta V$
(B) $\Delta E = \Delta H - P\Delta F$
(C) $\Delta H = \Delta E - P\Delta S$
(D) $\Delta H = \Delta E + P\Delta V$

10. Which of the following statements is not related to applications and limitations of first law of thermodynamics?
(A) This law explains why chemical reactions proceed to completion
(B) It is silent about the source of heat
(C) It is silent about the direction of heat
(D) It does not tell us about the reversible process

11. Total work done when the gas expands from initial volume V_1 to final volume V_2 under isothermal conditions is given as
(A) $nRT \ln \frac{V_2}{V_1}$ (B) $-nRT \ln \frac{V_2}{V_1}$
(C) $nRT \ln V_2$ (D) $-nRT \ln V_1$

12. Which of the following is always true for the adiabatic expansion of a gas?
(A) Temperature rises

(B) Pressure rises
(C) W = 0 (D) Q = 0

13. Which of the following statements is not related with Joule-Thomson Effect?
(A) Joule-Thomson is isonthalpic in nature
(B) H_2 and He show heating effect
(C) All gases show change in temperature
(D) Joule-Thomson coefficient is defined as $\mu = \left(\frac{\partial P}{\partial T}\right)_H$

14. For an ideal gas
(A) $\left(\frac{\partial P}{\partial T}\right)_V = 0$ (B) $\left(\frac{\partial E}{\partial T}\right)_P = 0$
(C) $\left(\frac{\partial E}{\partial V}\right)_T = 0$ (D) $\left(\frac{\partial E}{\partial T}\right)_V = 0$

15. The variation of enthalpy of reaction with temperature is given by
(A) Hesse's law
(B) Clasisus-Clapayron equation
(C) Kirchhoff's equation
(D) Arrhenius equation

16. Which of the following reactions have small enthalpy change?
(A) NaOH with HCl
(B) NaOH with CH_3COOH
(C) HCl with NH_4OH
(D) CH_3COOH with NH_4OH

17. Which of the following enthalpies is always negative?
(A) Enthalpy of melting
(B) Enthalpy of combustion
(C) Enthalpy of solution
(D) Enthalpy of formation

18. Regarding the internal energy of the molecules, which one of the following statements is not correct?
(A) It is the sum of vibrational, rotational and electronic energy
(B) Its absolute value cannot be determined
(C) It is a path function
(D) It is a state function

19. When two bodies have equality of temperature with a 3rd body, they in turn have equality of temperature with each other. This is a statement of
(A) First law of thermodynamics
(B) Zeroth law of thermodynamics
(C) Second law of thermodynamics
(D) Nernst heat theorem

20. Which of the following statements is not correct with respect to second law of thermodynamics?
(A) It helps in determining the direction of energy transfer
(B) It helps to know the position of chemical equilibrium
(C) It determines the conversion of heat into work
(D) It is based on Nernst heat theorem

21. Which of the following process is not related with Carnot cycle?
(A) Isothermal expansion
(B) Adiabatic expansion
(C) Isothermal compression
(D) Isobaric compression

22. The overall energy change during the Carnot cycle is
(A) Equal to zero (B) Equal to Q
(C) Equal to W (D) Maximum

23. If T_1 and T_2 are the temperatures of the heat source and sink, respectivel , then efficiency of the heat engine is defined as
(A) T_2/T_1 (B) T_1/T_2
(C) $1 + T_1/T_2$ (D) $1 - T_2/T_1$

24. The efficiency of a reversible heat engine depends only on the
(A) Temperature of the heat sink
(B) Temperature of the heat source
(C) Nature of the engine fluid
(D) Temperature of the heat source and sink

25. Which of the following is not a state function?
    (A) Temperature (B) Pressure
    (C) Heat (D) Volume

26. The entropy of the universe
    (A) Tends towards a maximum
    (B) Tend towards a minimum
    (C) Tends to be zero
    (D) Remains constant

27. Which of the following statements is not related with entropy?
    (A) It is a measure of disorder
    (B) It is a measure of unavailable energy
    (C) It is a function of thermodynamic probability
    (D) It is a path function

28. Which of the following expression is correct regarding entropy change of a reversible process?
    (A) $\Delta S > 0$ (B) $\Delta S = 0$
    (C) $\Delta S < 0$ (D) $\Delta S = 1$

29. If P_1, T_1 represent the initial state and P_2, T_2 the final state of an ideal gas, then entropy change may be expressed as
    (A) $\Delta S = C_p \ln \frac{T_2}{T_1} + R \ln \frac{P_2}{P_1}$
    (B) $\Delta S = C_v \ln \frac{T_2}{T_1} + R \ln \frac{P_2}{P_1}$
    (C) $\Delta S = C_p \ln \frac{T_2}{T_1} + R \ln \frac{P_1}{P_2}$
    (D) $\Delta S = C_p \ln \frac{T_1}{T_2} + R \ln \frac{P_1}{P_2}$

30. Which of the following causes decrease in entropy?
    (A) Conversion of ice into water
    (B) Precipitation of sucrose from water
    (C) Vaporization of camphor
    (D) Rusting of iron

31. Enthalpy of food and fuel is measured by
    (A) Monometer (B) Refractometer
    (C) Colorimeter (D) Bomb calorimeter

32. The condensation of any gas to a liquid is expected to have
    (A) A negative ΔH and a negative ΔS
    (B) A negative ΔH and a positive ΔS
    (C) A positive ΔH and a negative ΔS
    (D) A positive ΔH and a positive ΔS

33. Total kinetic energy of a molecule of a gas is due to
    (A) Translational motion
    (B) Rotational motion
    (C) Vibrational motion
    (D) All above

34. Which of the following does not represents the criterion of spontaneity of a reaction?
    (A) $\Delta F \leq 0$ (at constant T and P)
    (B) $\Delta H \leq 0$ (at constant S and P)
    (C) $\Delta E \leq 0$ (at constant S and V)
    (D) $\Delta S \leq 0$ (at constant V and E)

35. At constant T and P, the change in Gibbs free energy is represented by
    (A) $\Delta F = \Delta H - T\Delta S$ (B) $\Delta F = \Delta H + T\Delta S$
    (C) $\Delta F = \Delta A - T\Delta S$ (D) $\Delta F = \Delta A + T\Delta S$

36. At constant temperature, the decrease in Helmholtz free energy is equal to
    (A) Decrease in entropy
    (B) Increase in entropy
    (C) Maximum work done by the system
    (D) Irreversible work done by the system

37. At constant temperature and pressure, the decrease in Gibbs free energy (F) is equal to
    (A) Increase in entropy
    (B) Decrease in entropy
    (C) Maximum work done by the system
    (D) All types of work except the work of expansion

38. The variation of Gibbs free energy with P at constant temperature is given as

(A) $\Delta F = nRT \ln \frac{P_1}{P_2}$

(B) $\Delta F = nRT \ln \frac{P_2}{P_1}$

(C) $\Delta F = nRT \ln \frac{P_2V_1}{P_1V_2}$

(D) $\Delta F = nRT \ln \frac{P_1V_1}{P_2V_2}$

39. The variation of Gibbs free energy with temperature is expressed by

(A) $\frac{\partial(\Delta F/T)}{\partial T} = -\frac{\Delta S}{T_2}$

(B) $\frac{\partial(\Delta F/T)}{\partial T} = \frac{\Delta H}{T_2}$

(C) $\frac{\partial(\Delta F/T)}{\partial T} = -\frac{\Delta H}{T_2}$

(D) $\frac{\partial(\Delta F/T)}{\partial T} = -\frac{\Delta H}{T}$

40. For the expression dF = VdP – SdT, which of the following is correct

(A) $\left(\frac{\partial F}{\partial P}\right)_T = -S$ (B) $\left(\frac{\partial F}{\partial T}\right)_P = V$

(C) $\left(\frac{\partial F}{\partial T}\right)_S = V$ (D) $\left(\frac{\partial F}{\partial P}\right)_T = V$

41. All naturally occurring processes processed spontaneously in a direction leads to

(A) Decrease of entropy
(B) Increase in internal energy
(C) Decrease in free energy
(D) Increase in temperature

42. The Gibbs-Helmholtz equation may be expressed as

(A) $\Delta H = \Delta F + T\left(\frac{\partial(\Delta F)}{\partial T}\right)_P$

(B) $\Delta F = \Delta H - T\left(\frac{\partial \Delta F}{\partial T}\right)_P$

(C) $\Delta F = \Delta H + T\left(\frac{\partial \Delta F}{\partial T}\right)_P$

(D) $\Delta F = \Delta E + T\left(\frac{\partial \Delta F}{\partial T}\right)_P$

43. In the bomb calorimeter, the reaction is carried out at

(A) Constant P (B) Constant T
(C) Constant Q (D) Constant V

44. Which of the following expression describes the exact relationship between standard free energy change and equilibrium constant?

(A) $\Delta F = RT \ln K$

(B) $\Delta F^0 = -RT \ln K$

(C) $\Delta F = \Delta H - T\Delta S$

(D) $\Delta F = nRT \ln \frac{P_2}{P_1}$

45. Which law of thermodynamics helps in calculating the absolute entropies of varies substances?

(A) Zeroth law (B) Ist law
(C) Second law (D) Third law

46. The entropy change accompanying any physical or chemical transformation approaches zero as T approaches zero. This statement refers to

(A) Helmholtz law
(B) Third law of thermodynamics
(C) Second law of thermodynamics
(D) Nernst heat theorem

47. Which of the following is the statement of third law of thermodynamics?

(A) Entropy of perfectly crystalline substance is zero at T = 0
(B) Entropy of a perfectly crystalline substance is zero at standard state conditions
(C) Entropy and enthalpy of a substance become equal at T = 0
(D) Free energy of a crystalline substance is zero at T = 0

48. At any temperature T, entropy of a solid substance can be calculated using the expression

(A) $C_p dT$ (B) C_p/T

(C) $\frac{C_p - C_v}{T}$ (D) $\int_0^T \frac{C_p \cdot dT}{T}$

49. Which of the following expression represent the chemical potential or partial molar free energy?

(A) $\bar{V}_i = \left(\frac{\partial V}{\partial n_i}\right)_{T,P,n_1,n_2}$

(B) $\bar{E}_i = \left(\frac{\partial E}{\partial n_i}\right)_{T,P,n_1,n_2}$

(C) $\bar{F}_i = \left(\frac{\partial F}{\partial n_i}\right)_{T,P,n_1,n_2}$

(D) $\bar{H}_i = \left(\frac{\partial H}{\partial n_i}\right)_{T,P,n_1,n_2}$

50. Enthalpy of combustion is

(A) No correlation (B) Negative

(C) Positive

(D) May be positive or negaive

51. The chemical potential of a component i(having partial pressure P_i) of a mixture of ideal gases is expressed as

(A) $\mu_i = \mu_i^o + RT \ln P_i$

(B) $\mu_i = \mu_i^o + \frac{\ln P_i}{RT}$ (C) $\mu_i = \mu_i^o - RT \ln P_i$

(D) $\mu_i = \mu_i^o + \ln P_i$

52. If n_1 and n_2 represent moles of two components and μ_1 and μ_2 their chemical potentials, respectively, then Gibbs-Duhem equation for this binary system is written as

(A) $n_1 du_2 = n_2 du_1 = 0$

(B) $n_1 du_1 + n_2 du_2 = 0$

(C) $n_1 du_1 + n_2 du_2 > 0$

(D) $n_1 du_1 - n_2 du_2 = 0$

53. The link between classical thermodynamic and quantum mechanics is provided by

(A) Statistical mechanics

(B) Boltzmann law

(C) Wave mechanics

(D) Matrix mechanics

54. The enthalpy of an element in standard state is

(A) Zero (B) 1kJ/mole

(C) 298 kJ/mole (D) None of these

55. In statistical mechanics, there exists a function which contains all the information about a macroscopic system. This function is known as

(A) Eigen function (B) Wave function

(C) Partition function

(D) Distribution function

56. Which of the following equation represents the partition function?

(A) $Q = g_i e^{-\epsilon_i/kT}$ (B) $Q = \Sigma g_i e^{-\epsilon_i/kT}$

(C) $Q = \Sigma g_i e^{-\epsilon_i/RT}$ (D) $Q = e^{-\epsilon_i/RT}$

57. Boltzmann distribution law is defined as

(A) $\frac{N}{n_i} = \frac{e^{-\epsilon_i/kT}}{Q}$ (B) $\frac{n_i}{N} = \frac{e^{-\epsilon_i/RT}}{Q}$

(C) $\frac{n_i}{N} = \frac{e^{-\epsilon_i/kT}}{Q}$ (D) $\frac{n_i}{N} = Q$

58. Which of the following equation represents translational partition function?

(A) $Q_t = \left(\frac{2mkT}{h^2}\right)^{3/2}_V$

(B) $Q_t = \left(\frac{2\pi mkT}{h}\right)^{3/2} \cdot V$

(C) $Q_t = \left(\frac{2\pi mkT}{h^2}\right)^{3/2} \cdot V$

(D) $Q_t = \left(\frac{2\pi kT}{h^2}\right)^{3/2} \cdot V$

59. Which of the following has the highest value?
(A) Translational partition function
(B) Rotational partition function
(C) Vibrational partition function
(D) Electronic partition function

60. In which substance(s) $\Delta E = \Delta H$ and no PV work?
(A) Gases (B) Liquids
(C) Solids only
(D) Both liquids and solids

61. In an adiabatic system, if work is done, the temperature must
(A) Increase (B) Decrease
(C) Remain the same
(D) None of above

62. The heat flow of a system under isochoric conditions is a direct measurement of
(A) ΔF (B) Work
(C) ΔH (D) ΔE

63. According to Le-chatelir's principle the addition of heat to the following reactions $CO_2 + 2H_2O \longrightarrow CH_4 + 2O_2$ will cause it to shift to right. The reaction can therefore be described as
(A) Spontaneous (B) Exothermic
(C) Endothermic (D) Adiabatic

64. For the reaction given below:
$CaCO_3 \longrightarrow CaO + CO_2$
When taking place at higher temperature, the following is true
(A) $\Delta H < 0, \Delta F \geq 0$ (B) $\Delta H \leq 0, \Delta F < 0$
(C) $\Delta S > 0, \Delta F < 0$ (D) $\Delta F \geq 0, \Delta A \geq 0$

65. At constant volume the heat of a reaction is represented by
(A) ΔA (B) ΔH
(C) ΔE (D) ΔF

66. Which of the following is correct for adiabatic reversible process?
(A) $\Delta T = 0$ (B) $\Delta P = 0$
(C) $\delta W = 0$ (D) $\delta Q = 0$

67. The thermodynamic parameter, which is a state function and is measure of disorder of a system is called
(A) Internal energy
(B) Entropy (C) Free energy
(D) Enthalpy

68. Which of the following makes the motion of perpetual motion machine a physical impossibility?
(A) First law of thermodynamics
(B) Second law of thermodynamics
(C) Third law of thermodynamics
(D) The Boltzmann law

69. The statement that heat cannot flow spontaneously from a colder to a hotter body is the result of
(A) The first law of thermodynamics
(B) The second law of thermodynamics
(C) The third law of thermodynamics
(D) Henry's law

70. Internal energy of a given mass of an ideal gas depends upon
(A) Temperature (B) Pressure
(C) Volume (D) All above

71. Which of the following provides physical significance of ΔF?
(A) $\Delta F = \Delta H - T\Delta S$ (B) $\Delta F = W_{max}$
(C) $\Delta F = W_{useful}$ (D) $-\Delta F = W_{useful}$

72. For an endothermic process to be spontaneous
(A) ΔF must be positive
(B) ΔS must be greater than zero
(C) $T\Delta S$ must be negative
(D) All above

73. Use of thermometer is based on which law of thermodynamics?
(A) First law (B) Zeroth law
(C) 2nd Law (D) 3rd law

74. For a reversible process entropy change is
(A) $\Delta S = 0$ (B) $\Delta S < 0$
(C) $\Delta S > 0$ (D) All above

75. One calorie is equivalent to
(A) 8.314 J (B) 4.184 J
(C) 41.84 J (D) 83.14 J

ANSWERS

1. C	2. C	3. B	4. D
5. A	6. D	7. C	8. B
9. D	10. A	11. B	12. D
13. D	14. C	15. C	16. A
17. B	18. C	19. B	20. D
21. D	22. A	23. D	24. D
25. C	26. A	27. D	28. B
29. C	30. B	31. D	32. A
33. D	34. D	35. A	36. C
37. D	38. B	39. C	40. D
41. C	42. C	43. D	44. B
45. D	46. D	47. A	48. D
49. C	50. B	51. A	52. B
53. A	54. A	55. C	56. B
57. C	58. C	59. A	60. D
61. B	62. D	63. C	64. C
65. C	66. D	67. B	68. A
69. B	70. A	71. D	72. B
73. B	74. A	75. B	

1.5. CHEMICAL AND IONIC EQUILIBRIA

1. Which of the following properties of a system does not change in a state of equilibrium?
   (A) Density (B) Pressure
   (C) Concentration
   (D) All above properties

2. Which of the following statements is not related with chemical equilibrium?
   (A) The properties of the system become constant
   (B) The equilibrium can be approached from either direction
   (C) The chemical equilibrium is dynamic in nature
   (D) The chemical equilibrium is static in nature

3. The equilibrium constant, may increase, decrease or remain constant with increase in temperature, which of the following expression describes the dependence of equilibrium constant on temperature
   (A) $\frac{d(\ln K)}{dT} = \frac{\Delta H^o}{RT}$ (B) $\frac{d(\ln K)}{dT} = \frac{\Delta H^o}{RT^2}$
   (C) $\frac{d(\ln K)}{dT} = \frac{-\Delta F^o}{RT}$ (D) $K = -RT \ln \Delta F^o$

4. At equilibrium the free energy change (ΔF) for a reaction is
   (A) Maximum (B) Minimum
   (C) Zero (D) Infinite

5. Equilibrium constants K_p and K_c are related as
   (A) $K_c = K_p(RT)^{\Delta n}$ (B) $K_p = K_c(RT)^{\Delta n}$
   (C) $K_p = \left(\frac{K_c}{RT}\right)^{\Delta n}$ (D) $K_p - K_c = (RT)^{\Delta n}$

6. The equilibrium constants K_p and K_x are related as
   (A) $K_p = K_x P^{\Delta n}$ (B) $K_p = \frac{K_x}{P^{\Delta n}}$
   (C) $K_x = K_p(RT)^{\Delta n}$ (D) $K_x = K_p\left(\frac{P}{RT}\right)^{\Delta n}$

7. Which of the following hypothetical reactions is favored by increase of temperature and pressure?
   (A) $A + B \rightleftharpoons C + D$ $\Delta H = -ve$
   (B) $A + 2B \rightleftharpoons 2C + D$ $\Delta H = +ve$
   (C) $2A + B \rightleftharpoons C + D$ $\Delta H = +ve$
   (D) $2A + 2B \rightleftharpoons 2C + 2D$ $\Delta H = -ve$

8. In the equilibrium reaction
   $N_{2(s)} + 3H_{2(s)} \rightleftharpoons 2NH_{3(s)} + 22.9$ kcal
   the equilibrium shifts to the forward direction on
   (A) Increasing the P and decreasing the T
   (B) Decreasing the P as well as T
   (C) Increasing the P as well as T
   (D) Decreasing the P and increasing the T

9. According to LeChatlier's principle, the formation of NO_2 at equilibrium in the reaction
   $2NO + O_2 \rightleftharpoons 2NO_2 + \text{heat}$
   should be favoured by
   (A) High T and high P
   (B) Low T and low P
   (C) Low T, high P
   (D) High temperature

10. Formation of SO_3 takes place according to the following reaction
    $2SO_2 + O_2 \rightleftharpoons 2SO_3$ $\Delta H = -45.2$ kcal

Which of the following factors will favor the formation of SO_3?

(A) Increase of T (B) Increase of P
(C) Removal of O_2
(D) Increase of volume

11. For which of the following equilibrium does decrease in pressure not favour the forward reaction?

(A) $CaCO_{3(s)} \rightleftharpoons CaO(s) + CO_{2(g)}$
(B) $CO_{(g)} + 2H_{2(g)} \rightleftharpoons CH_3OH_{(l)}$
(C) $NH_4Cl_{(s)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$
(D) $2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$

12. Four moles of A are mixed with four moles of B when 2 mol of C are formed at equilibrium, according to the reaction

$A + B \rightleftharpoons C + D$

The value of the equilibrium constant is

(A) 1/2 (B) 1/4
(C) 1 (D) 8

13. When 3 moles of ethyl alcohol are mixed with 3 mole of acetic acid, 2 moles of ester are formed at equilibrium according to the equation

$CH_3COOH + C_2H_5H \rightleftharpoons CH_3COOC_2H_5 + H_2O$

The value of the equilibrium constant for the reaction is

(A) 4 (B) 2/9
(C) 2 (D) 4/9

14. According to Arrhenius theory, an acid is defined as substance which

(A) Accepts an electron pair
(B) Donates H^+ ion in ammonia
(C) Contains Cl^- ions
(D) Furnishes H_3O^+ ion in water

15. Which of the following can act both as a Bronsted acid and a Bronsted base?

(A) Na_2CO_3 (B) OH^-
(C) HCO_3^- (D) NH_3

16. Which of the following is not a Lewis base?

(A) CN^- (B) $AlCl_3$
(C) ROH (D) NH_3

17. In the reaction

$HCN + H_2O \rightleftharpoons H_3O^+ + CN^-$

the conjugate acid-base pair is

(A) HCN, H_3O^+ (B) H_2O, CN^-
(C) CN^-, H_3O^+ (D) HCN, CN^-

18. HS^- is a conjugate base of

(A) S^{2-} (B) H_2S
(C) H_2SO_3 (D) H_2SO_4

19. Which of the following statement is not correct regarding Lewis acids and bases?

(A) NH_3 and H_2O both behaves as Lewis bases
(B) Substances which donate a pair of electrons are called Lewis bases
(C) All Lewis bases are also Bronsted bases
(D) Lewis base must contain an atom having less than an octet of electron

20. Which of the following acid-base reaction is according to Lewis classification?

(A) $H^+ + OH^- \rightleftharpoons H_2O$
(B) $HCN + H_2O \rightleftharpoons H_3O^+ + CN^-$
(C) $H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$
(D) $(CH_3)_3N + BF_3 \rightleftharpoons (CH_3)_3N : BF_3$

21. The sum of pH and pOH in aqueous solution is equal to

(A) 14 (B) Zero
(C) pKw (D) 7

22. The value of pKw at 25°C

(A) 14 (B) 1×10^{-14}
(C) 0.14 (D) 1.4

23. Which of the following solution has pH = 11?
(A) 1×10^{-11} m NaOH
(B) 1×10^{-11} M HCl
(C) 1×10^{-3} M NaOH
(D) 1×10^{3} M NaOH

24. The pKa of an acid having ionization constant 1×10^{-5} is
(A) –5 (B) 5
(C) 9 (D) –9

25. Which of the following will have the largest pH?
(A) 0.1 N HCl
(B) 0.1 N CH_3COOH
(C) 0.1 N NaOH (D) 0.01 N NaOH

26. The pH of a buffer solution containing an acid and its salt is
(A) $pKa + \log \frac{|S|}{|A|}$
(B) $pKa + \log \frac{|A|}{|S|}$
(C) $\frac{1}{2} pKa - \log \frac{|A|}{|S|}$
(D) $\log pKa + \log \frac{|S|}{|A|}$

27. The pH of water is 7 at 25°C. If water is heated to 70°C, which of the following should be true?
(A) pH will decrease
(B) pH will increase
(C) pH will remain constant
(D) Concentration of H^+ will increase and OH^- will remain same

28. The pink colour of phenolphthalein in basic medium is due to the
(A) Cationic form
(B) anionic form (C) Neutral form
(D) OH^- ions of the base

29. The pH of a buffer solution containing a weak base and its salt can be related to pKb as
(A) $pH = pKb - \log \frac{|S|}{|A|}$
(B) $pH = \frac{1}{2} pKb - \frac{1}{2} \log \frac{|S|}{|A|}$
(C) $pH = 14 - pKb - \log \frac{|S|}{|A|}$
(D) $pH = pOH - pKb + \log \frac{|S|}{|A|}$

30. The correct order of increasing acid strength is
(A) $H_2N_2O_2 < HNO_2 < HNO_3$
(B) $H_2N_2O_2 < HNO_3 < HNO_2$
(C) $HNO_2 < HNO_3 < H_2N_2O_2$
(D) $HNO_3 < H_2N_2O_2 < HNO_2$

31. The correct order of acidic strength is
(A) HF < HCl < HI < HBr
(B) HI < HBr < HCl < HF
(C) HI < HBr < HF < HCl
(D) HF < HCl < HBr < HI

32. The correct order of acid strength is
(A) $HIO_4 > HBrO_4 > HClO_4$
(B) $HClO_4 > HBrO_4 > HIO_4$
(C) $HBro_4 > HIO_4 > HClO_4$
(D) $HBrO_4 > HClO_4 > HIO_4$

33. Which of the following specie is a stronger acid than formic acid, HCOOH, in aqueous solution?
(A) CH_3COOH (B) NH_4^+
(C) $H_2SO_3^-$ (D) $H_4P_2O_7$

34. The degree of dissociation of weak acid increases with
(A) Decreasing pressure
(B) Increasing pressure
(C) Increasing concentration
(D) Decreasing concentration

35. A 2M solution of H_2SO_4 would have how many moles of H^+ ion in one liter?
(A) 1.0 (B) 2.0
(C) 3.0 (D) 4.0

36. A pH of a neutral solution at 100°C when Kw = 1.0×10^{-12} is
(A) 0 (B) 7
(C) 6 (D) 2

37. Which of the following is a buffer solution?
(A) $CH_3COOH + NH_4OH$
(B) $CH_3COOH + HCl$
(C) $CH_3COOH + NaOH$
(D) $CH_3COOH + CH_3COONa$

38. Which of the following is not a buffer?
(A) H_2CO_3/HCO_3^-
(B) NH_4Cl/NH_4OH
(C) CH_3COOH/CH_3COONa
(D) NH_4OH/CH_3COOH

39. The pKa of acetic acid is 4.74, which implies that
(A) pH of 1N solution is 4.74
(B) At pH 4.74, the dissociation of acetic acid is maximum
(C) At pH 4.74, half of the acetic acid molecules are dissociated in the solution
(D) At pH 4.74, the dissociation of acetic acid is minimum

40. Which parameter of a chemical reaction will change with the use of a catalyst?
(A) ΔF, change in free energy
(B) ΔS, change in entropy
(C) ΔE, change in internal energy
(D) K, the rate constant

41. If 20 ml of 0.5 N salt solution is diluted to one litre, what is the new concentration?
(A) 0.01 N (B) 0.00 1N
(C) 1N (D) 10 N

42. The pH of human blood is about
(A) 7.2 (B) 6.2
(C) 7.8 (D) 7.5

43. Azeotropic mixture can be separated by
(A) Simple distillation
(B) Fractional distillation
(C) Vacuum distillation
(D) Destructive distillation

44. Which of the following has highest pH?
(A) 0.1 M HCl (B) 0.1 M NaOH
(C) 0.1 M HNO_3 (D) 0.2 M HCl

45. The precipitation occurs if the ionic concentration is
(A) Less than Ksp (B) More than Ksp
(C) Equal to ksp
(D) None of the above

46. The pH of milk is
(A) 5.5 (B) 6.5
(C) 7.5 (D) 8.5

47. The pH of soft drink is
(A) 2 (B) 3
(C) 5 (D) 6

48. The sum of $[H^+]$ and $[OH^-]$ in pure water is
(A) 7 (B) 12
(C) 13 (D) 14

49. The pH of 0.001 M HCl in water is
(A) 5 (B) 4
(C) 2 (D) 3

50. The pH of 0.001 M NaOH is
(A) 14 (B) 12
(C) 13 (D) 11

51. The molarity of pure water is
(A) 7 M (B) 18 M
(C) 14 M (D) 55.5 M

52. Which of the following affect the Kc value?
(A) Temperature (B) Pressure
(C) Catalyst (D) All above

ANSWERS

1. D	2. D	3. B	4. C	25. C	26. A	27. A	28. B
5. B	6. A	7. C	8. C	29. C	30. A	31. D	32. B
9. C	10. B	11. B	12. B	33. C	34. D	35. D	36. C
13. D	14. D	15. C	16. B	37. D	38. D	39. B	40. D
17. D	18. B	19. D	20. D	41. A	42. A	43. C	44. B
21. A	22. B	23. C	24. B	45. B	46. B	47. B	48. D
				49. D	50. D	51. D	52. A

1.6. SOLUTION CHEMISTRY AND PHASE EQUILIBRIA

1. Which of the following is not a colligative property?
(A) Lowering of vapor pressure
(B) Elevation in boiling point
(C) Cryoscopy
(D) Freezing point

2. Which of the following concentration term is used in respect of standard solutions?
(A) Normality
(B) Formality
(C) Molarity
(D) All of above

3. If there are only two components in a solution with mole fraction X_A and X_B, then which of the following relation is correct?
(A) $X_A + X_B = 0$
(B) $X_A + X_B > 1$
(C) $X_A = X_B < 1$
(D) $X_A = 1 - X_B$

4. A 10% solution of sucrose contains 10g of sucrose in how much volume of the solution?
(A) 10 mL
(B) 100 mL
(C) 1000 mL
(D) 1 mL

5. The number of moles of the solute dissolved per dm^3 of the solution is called
(A) Molality
(B) Formality
(C) Normality
(D) Molarity

6. The number of gram equivalents of the solute per dm^3 of the solution is called
(A) Formality
(B) Normality
(C) Molality
(D) Molarity

7. The number of moles of solute dissolved in 1000 gram of the solvent is called
(A) Formality
(B) Molality
(C) Molarity
(D) Mole fraction

8. The number of formula weight of the solute dissolved per dm^3 of the solution is called
(A) Mole fraction
(B) Normality
(C) Formality
(D) Molality

9. One ppm solution of NaOH contains 1000 mg of the solute per how much of the volume of the solution?
(A) 1000 mL
(B) 100 mL
(C) 10 mL
(D) 1 mL

10. How much amount of NaOH is required to prepare 100 mL of 1N solution?
(A) 40 g
(B) 80 g
(C) 4 g
(D) 0.4 g

11. One litre solution of NaOH contains 4.0 g of it. What will be the difference between molarity and normality? (Moler mass = 40)
(A) 0.10
(B) 0.05
(C) 0.02
(D) Zero

12. The molarity of a 500 mL solution containing 4g NaOH (Mol mass = 40) is
(A) 0.1
(B) 0.2
(C) 0.3
(D) 0.4

13. Which of the following solutions of sulphuric acid will exactly neutralize 25 mL of 0.2 M NaOH?
(A) 12.5 mL of 0.1 M solution
(B) 25 mL of 0.1 M solution
(C) 50 mL of 0.1 M solution
(D) 50 mL of 0.2 M solution

14. Solutions with components which obeys Raoult's law over the entire composition range are said to be

(A) Real solutions
(B) Regular solutions
(C) Dilute solutions
(D) Ideal solutions

15. Which of the following is a not correct criterion for an idea solution?
(A) Enthalpy of mixing = 0
(B) Volume of mixing = 0
(C) Free energy of mixing = 0
(D) Obeys Raoult's law

16. Which cation has least heat of hydration?
(A) Li^+
(B) Na^+
(C) K^+
(D) Mg^{++}

17. Which of the following systems has low as well as upper consolute temperature?
(A) Nicotine – water
(B) Aniline – water
(C) Triethylamine – water
(D) Phenol – water

18. The temperature at which two conjugate solutions change into one homogeneous solution is called
(A) Azeotrope
(B) Eutectic point
(C) Consolute temperature
(D) Transition temperature

19. The law which relates the solubility of a gas to its pressure is called
(A) Raoult's law
(B) Nernst law
(C) Ostwald's law
(D) Hennery's law

20. When a solute S exists as such in phase I and associates in phase II forming S_n species, then the distribution law can b expressed as
(A) $K = \frac{C_I}{C_{II}}$
(B) $K = \left(\frac{C_I}{C_{II}}\right)^{1/n}$
(C) $K = \frac{C_I}{C_{II}^{1/n}}$
(D) $K = \frac{C_I}{nC_{II}}$

21. According to Henry's law, the mole fraction of a gas (x) dissolved in a solvent is related to the pressure of the gas
(A) x = k/P
(B) P = kx
(C) $x = k\sqrt{P}$
(D) P = k/x

22. For dilute solutions colligative properties depend on
(A) The number of the particles of the solute and nature of solvent
(B) The number of the solute particles and on their nature
(C) The number of the solute particles and nature of solute and solvent
(D) The number of the solute particles and irrespective of the nature of the solute and solvent

23. Which of the following is not a colligative property?
(A) Elevation of B.P.
(B) Depression in F.P.
(C) Viscosity
(D) Lowering of V.P.

24. Which of the following properties does not depend upon the number of solute particles?
(A) Elevation in B.P.
(B) Osmotic pressure
(C) Depression in F.P.
(D) Boiling point of the solvent

25. If X_1 and X_2 are the mole fractions of the solvent and the solute, respectively, p^o the vapour pressure of the pure solvent and p the vapour pressure of the solvent above the solution, then according to Raoult's law
(A) $p^o = p^o X_1$
(B) $p = p^o(1 - X_2)$
(C) $p - p^o = X_1 - X_2$
(D) $\frac{p^o - p}{p^o} = \frac{X_1}{X_2}$

26. The temperature at which the vapour pressure becomes equal to external pressure is called

(A) Saturation point
(B) Critical temperature
(C) Consolute temperature
(D) Boiling point

27. The freezing point of a solvent
(A) Will increase on adding a solute
(B) Will decrease on adding a solute
(C) Will not change on adding solute
(D) None of the above

28. Iso-osmotic solutions are those which have the same
(A) Vapour pressure lowering
(B) Osmotic pressure
(C) Molality
(D) Boiling point elevation

29. The relative lowering of vapour pressure of a solution on the addition of non-volatile solute
(A) Is equal to the mole fraction of solute
(B) Is equal to the sum of the mole fraction of the solute and solvent
(C) Depends upon the nature of the solute
(D) Depends upon the nature of the solute and solvent

30. The osmotic pressure of a solution with definite composition
(A) Varies directly as the volume and temperature
(B) Varies inversely as the temperature
(C) Varies inversely as the volume and directly as the temperature
(D) Independent of the temperature and varies inversely as the volume

31. Which of the following solution would exhibit abnormal colligative properties?
(A) 0.1 M NaCl (B) 0.1 M urea
(C) 0.1 M sucrose (D) 0.1 M glucose

32. Which of the following solution would have the largest depression in freezing point?
(A) 1% glucose (B) 1% KCl
(C) 1% $BaCl_2$ (D) 1% $AlCl_3$

33. The flow of solvent into a solution when two are separated by a semi-permeable membrane is called
(A) Mixing (B) Effusion
(C) Diffusion (D) Osmosis

34. Sea water is converted into fresh water based upon the phenomenon of
(A) Plasmolysis (B) Sedimentation
(C) Diffusion
(D) Reverse osmosis

35. In dilute solutions the relative lowering of vapour pressure ($\Delta p/p^o$) is related to osmotic pressure (π) by the relation
(A) $\Delta p/p^o = \pi$ (B) $\Delta p/p^o = \pi RT$
(C) $\Delta p/p^o = \frac{\pi V}{RT}$ (D) $\Delta p/p^o = \frac{\pi RT}{v}$

36. At the same temperature, 0.1 M solution of urea is isotonic with
(A) 0.1 M glucose solution
(B) 0.1 M NaCl solution
(C) 0.05 M urea solution
(D) 0.1 M $BaCl_2$ solution

37. Which of the following will have the highest boiling point at one atmosphere?
(A) 0.1 M solution of common salt
(B) 0.1 M solution of glucose
(C) 0.1 M solution of $BaCl_2$
(D) 0.1 M solution of KCl

38. Which of the following expression is used to calculate the molar mass of the solute?
(A) $M = \frac{W_2RT}{\pi V}$ (B) $M = W_2RT/V$
(C) $M_2 = \frac{\pi V}{W_2RT}$ (D) $M_2 = \frac{V}{W_2T}$

39. Which of the following expression is correct?
(A) $C = \pi/RT$ (B) $C = RT/\pi$
(C) $RT = C\pi$ (D) $C\pi = \frac{1}{RT}$

40. Which of the following solution has highest normality?
(A) 1N H_3PO_4 (B) 0.5N H_2SO_4
(C) 8g KOH per dm^3
(D) 6g NaOH per 100 cm^3

41. The normality of 2.3M H_2SO_4 solution is
(A) 0.46N (B) 0.23N
(C) 2.3N (D) 4.6N

42. 30 mL of an acid solution is neutralized by 15 mL of 0.2N base. The strength of acid solution is
(A) 0.1N (B) 0.15N
(C) 0.3N (D) 0.4N

43. Starting with pure NH_4Cl, the following equilibrium is established
$NH_4Cl_{(g)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$
The number of components in the system is
(A) One (B) Two
(C) Three
(D) May be two or three

44. The number of phases of a mixture of four gases enclosed in a container is
(A) 4 (B) 4 – 1
(C) 1 (D) Zero

45. In terms of number of phases (P), components (C) and degrees of freedom (F), the phase rule is expressed as
(A) $P + C = F + 2$ (B) $F = P + C - 2$
(C) $P + F = C + 2$ (D) $P - F = C + 2$

46. The phase rule was deduced by
(A) Gibbs (B) Thomson
(C) Friday (D) Henry

47. In a system, when the chemical potential of each component is the same for all phases, the equilibrium is said to be in
(A) Metastable equilibrium
(B) Thermal equilibrium
(C) Composition equilibrium
(D) Mechanical equilibrium

48. In a one-component system, the maximum number of phase that can coexist in equilibrium is
(A) 1 (B) 2
(C) 3 (D) 4

49. The maximum degree of freedom for a pure substance under equilibrium conditions is
(A) 1 (B) 2
(C) 3 (D) Zero

50. Sulphur can exist in
(A) One phase (B) Two phases
(C) Three phases (D) Four phases

51. The number of degree of freedom for the system
$NH_4Cl_{(s)} \rightleftharpoons NH_4Cl_{(g)} \rightleftharpoons NH_{3(g)} + HCl(g)$ is
(A) 1 (B) 3
(C) Zero (D) 2

52. For a single-component system, the maximum degree of freedom is
(A) 1 (B) 2
(C) 3
(D) Between 3 and 6

53. The point in the pressure-temperature curve of a water system where the equilibrium
Ice $\rightleftharpoons$ Water $\rightleftharpoons$ Vapour
exists is called the
(A) Critical point (B) Triple point
(C) Transition point
(D) Eutectic point

54. The number of degrees of freedom and number of components for a system of sodium chloride solution in water

containing undissolved salt, in equilibrium with water vapour, are
(A) 2, 2 (B) 3, 2
(C) 1, 1 (D) 1, 2

55. The number of degrees of freedom at the triple point for the water system is
(A) One (B) Two
(C) Three (D) Zero

56. Which of the following is partially miscible?
(A) Benzene and toluene
(B) Ethanol and water
(C) HCl and water
(D) Butanol and water

57. The molarity of 25% NaOH solution is (Mol wt=40)
(A) 1.5 (B) 2.5
(C) 3.5 (D) 4.5

58. The properties which donot depend on the amount of substance are called
(A) Colligative properties
(B) Additive properties
(C) Extensive properties
(D) Intensive Properties

59. Beckman thermometer reads upto
(A) 1 K (B) 0.1 K
(C) 0.001 K (D) 0.01K

60. A 10 % solution of glucose contains 1 g per
(A) 10 mL (B) 100 mL
(C) 1 mL (D) 500 mL

61. Which of the following concentration term is used for very dilute solutions?
(A) Molarity (B) Normality
(C) Molality (D) ppm

62. Which of the following is not affected by tempertature change
(A) Molarity (B) Formality
(C) ppm (D) Molality

63. Hydrolysis of sodium acetate produces
(A) Acidic solution
(B) Neutral solution
(C) Basic solution
(D) None of the above

64. A 10 % solution of glucose freezes at
(A) 0 °C (B) Less than 0 °C
(C) More than 0°C (D) None of these

65. A mixture of benzene and toluene forms
(A) Ideal solution
(B) Non-ideal solution
(C) Suspension
(D) Azeotropic mixture

ANSWERS

1. D	2. D	3. D	4. B
5. D	6. B	7. B	8. C
9. A	10. C	11. D	12. B
13. A	14. D	15. C	16. C
17. A	18. C	19. D	20. C
21. B	22. A	23. C	24. D
25. B	26. D	27. B	28. B
29. A	30. C	31. A	32. D
33. D	34. D	35. C	36. A
37. C	38. A	39. A	40. D
41. D	42. A	43. A	44. C
45. C	46. A	47. C	48. C
49. B	50. D	51. A	52. B
53. B	54. D	55. D	56. D
57. B	58. D	59. D	60. A
61. D	62. D	63. C	64. B
65. A			

1.7. CHEMICAL KINETICS

1. The branch of chemistry which deals with the rate of reaction as well as mechanism is known as
(A) Wave mechanism
(B) Classical thermodynamics
(C) Chemical kinetics
(D) Photochemistry

2. Which of the following factors affect the rate of the reaction?
(A) Pressure (B) Temperature
(C) Concentration (D) All of above

3. The change in the concentration of the reactant or product per unit time is called
(A) Order of the reaction
(B) Molecularity of the reaction
(C) Rate constant (D) Rate of reaction

4. Usually the rate of the reaction is expressed as
(A) $mol\ dm^{-3}$ (B) $mol\ dm^{-3}\ s^{-1}$
(C) $mol\ dm^{-2}\ s^{-1}$ (D) $mol^2\ dm^{-2}\ s^{-1}$
(E) $mol\ dm^{-3}\ s^{-2}$

5. The rate at which a substance reacts depends on its
(A) Molecular mass
(B) Active mass
(C) Atomic mass (D) Molar mass

6. Chemical kinetics is used to study
(A) Rate of reaction
(B) Mechanism of reaction
(C) Effect of temperature on reaction rate
(D) All above

7. The reaction in which the rate is independent of concentration is called
(A) First order (B) Zero order
(C) Third order (D) Second order

8. Which of the following expressions can be used to describe the instantaneous rate of the reaction?
$2A + B \longrightarrow A_2B$
(A) $-\frac{1}{2}\frac{d|A|}{dt}$ (B) $\frac{-d|A|}{dt}$
(C) $\frac{1}{2}\frac{d|A_2B|}{dt}$ (D) $-\frac{1}{2}\frac{d|B|}{dt}$

9. The rate constant of a reaction depends on
(A) Concentration of reactants
(B) Concentration of products
(C) Pressure (D) Temperature

10. The Arrhenius equation accounts for the rate of chemical reaction in terms of?
(A) Order of reaction
(B) Molecularity of reaction
(C) Activation energy
(D) Physical state

11. The dimensions for first order rate constant are
(A) s^{-1} (B) $s\ mol^{-1}$
(C) $mol^{-1}\ s^{-1}$ (D) s

12. The rate constant of a reaction has same units as the rate of the reaction. The reaction is of
(A) Second order (B) First order
(C) Third order (D) Zero order

13. The rate constant for 3rd order reaction has the dimensions of
(A) $mol^{-2}\ s^{-1}$ (B) $l^2\ mol^{-2}\ s^{-1}$
(C) $mol\ l^{-1}\ s^{-1}$ (D) $l^{-1}\ mol^{-1}\ s^{-1}$

14. A second order rate constant can have units
(A) $dm^{-6}\ mol^2\ s^{-1}$ (B) $dm^3\ mol\ s^{-1}$
(C) $dm^6\ mol^{-2}\ s^{-1}$ (D) $dm^3\ mol^{-1}\ s^{-1}$

15. For a reaction of the type
$A + B \longrightarrow$ Products
It is observed that doubling the concentration of A causes the reaction rate to be four times as great, but doubling the amount of B there is no apparent affect on the rate. The rate equation is
(A) Rate = k|A| |B|
(B) Rate = $k|A|^2$
(C) Rate = $k|A|^2|B|$
(D) Rate = $k|A|^2|B|^2$

16. For the reaction
$2A + B \longrightarrow C + D$
The rate of the reaction increase eight times when the concentrations of both A and B are doubled. The rate of the reaction increase four times when the initial concentration of only B is doubled. The rate expression for the reaction is
(A) $r = k|A^2||B|$ (B) $r = k|A||B|^2$
(C) $r = k|A||B|$ (D) $r = k|A|^2|B|^2$

17. The order of reaction of radioactive decay is
(A) 3 (B) 2
(C) 1 (D) Zero

18. For an elementary reaction
$2A + B \longrightarrow C + D$
The molecularity of the reaction is
(A) 1 (B) 2
(C) 3 (D) 4

19. Which of the following is an acceptable value of the molecularity?
(A) 6 (B) 2
(C) 0 (D) 3/2

20. Which of the following statement about molecularity is not correct?
(A) It cannot be fraction
(B) It can be obtained from balanced equation
(C) It may be or may not be equal to the order of the reaction
(D) It cannot be more than 3

21. Point out the incorrect statement.
(A) Rate law is an experimental fact whereas law of mass action is a theoretical in nature
(B) Rate law is always different from the expression of law of mass action
(C) Rate law is more informative than law of mass action
(D) Order of the reaction is equal to the sum of the exponents of concentration terms in the rate law

22. From an elementary reaction of the type
$A + 2B \longrightarrow C + D$,
the order of the reaction is
(A) Zero (B) 1
(C) 2
(D) Cannot be determined

23. The minimum amount of energy that the reacting molecules must possess at the time of collisions in order to produce effective collisions is called
(A) Free energy
(B) Activation energy
(C) Internal energy
(D) External energy

24. The following mechanism has been proposed for a reaction
$2A + B \longrightarrow D + E$
$A + B \longrightarrow C + D$ (slow)
$A + C \longrightarrow E$ (fast)
The rate expression for the reaction is
(A) $r = k|A|^2|B|$ (B) $r = k|A||B|$
(C) $r = k|A|^2$ (D) $r = k|A||C|$

25. For a chemical reaction A → products, the rat of the reaction doubles when the concentration of A is increased by 4 times. The order of the reaction is
(A) 4 (B) 0
(C) $\frac{1}{2}$ (D) 1

26. For a hypothetical reaction
$A + B \longrightarrow$ Products,
the rate law is $r = k|B|^2|A|^0$ the order of the reaction is
(A) 0 (B) 1
(C) 2 (D) 3

27. The hydrolysis of methyl acetate is a reaction of
(A) First order (B) Second order
(C) Third order (D) Zero order

28. Consider the first order reaction
$A \longrightarrow B$
If the initial concentration of A is a and B is zero, and at any time t the concentration of B is x, then the rate equation can be written as
(A) $k = \frac{1}{t} \ln \frac{(a-x)}{a}$ (B) $kt = \ln(a-x)$
(C) $kt = \ln \frac{a}{(a-x)}$ (D) $\frac{k}{t} = \ln \frac{a}{(a-x)}$

29. If C_A is the concentration of A at any time and C_A^o is its concentration at t = 0, then, for a zero-order reaction of the type A → Products, the rate equation can be written as
(A) $C_A - C_A^o = 0$ (B) $C_A = C_A^o - k$
(C) $C_A / C_A^o = k$ (D) $C_A = C_A^o - kt$

30. For a reaction of the type (second order in A)
$A \longrightarrow$ Product
if the initial concentration of A is a and at a given time t, the concentration of product is x, the rate constant (k) can be put as
(A) $k = t(a-x)$
(B) $k = t\left(\frac{1}{(a-x)} - \frac{1}{a}\right)$
(C) $k = \frac{1}{t}\left(\frac{1}{(a-x)} - \frac{1}{a}\right)$
(D) $k = \frac{1}{t}\left(\frac{1-x}{a}\right)$

31. In multistep reaction, the slowest step is the
(A) Mechanism step
(B) Rate determining step
(C) Enthalpy determining step
(D) None of the above

32. The half-life period of any first order reaction
(A) Is half the specific rate constant
(B) Is independent of the initial concentration
(C) Is always the same whatever the reaction
(D) Is directly proportional to the initial concentration of the reactant

33. Consider the third order rate equation
$K = \frac{1}{2t}\left(\frac{1}{C_o^2} - \frac{1}{C_2}\right)$
where C_o is the initial concentration and C is the concentration at time t. The half life period ($t_{1/2}$) is
(A) $t_{1/2} = \frac{1}{k\,C_o}$ (B) $t_{1/2} = \frac{3k}{2C_o^2}$
(C) $t_{1/2} = \frac{3}{2k\,C_o^2}$ (D) $t_{1/2} = \frac{3}{2k\,C_o}$

34. Which of the following methods are used to determine the rate of the raection
(A) Spectroscopy
(B) Conductometry
(C) Polarimetry (D) All of above

35. For reaction
$A + B \longrightarrow C$
the following kinetic data are obtained

Observation	A	B	Rate
1	0.1	0.2	0.01
2	0.2	0.2	0.04
3	0.2	0.8	0.08

The overall order of the reaction is
(A) 3 (B) 2
(C) 1.5 (D) 2.5

36. A catalyst increases the rate of a reaction because
(A) It provides the necessary energy to the colliding molecules to cross energy barrier
(B) It decreases the heat of the reaction
(C) It decreases the order of the reaction
(D) It provides a different path of lower activation energy

37. Chemical reactions of the type
$A \xrightarrow{k_1} B \xrightarrow{k_2} C$
are called
(A) Pseudo chemical reactions
(B) Consecutive reactions
(C) Parallel reactions
(D) Fast reactions

38. In dilatometric method, the rate of reaction is measured by change in
(A) Pressure (B) Volume
(C) Concentration (D) Conductance

39. The rate of reaction between two specific time intervals is called
(A) Average rate
(B) Instantaneous rate
(C) Rate constant
(D) Rate of reaction

40. For the first-order reaction with rate constant k, the half-life period (initial concentration = a) is equal to
(A) $\frac{\ln 2}{k}$ (B) $\frac{1}{ka}$
(C) $\frac{0.693}{ka}$ (D) $\frac{1}{ka_{1/2}}$

41. The equation for the rate constant is given by
$k = p\,Ze^{-E_a/RT}$
a chemical reaction will proceed more rapidly if there is a decrease in
(A) T (B) Z
(C) E (D) P

42. The large increase in the rate of a reaction on rise in temperature is due to
(A) The lowering of activation energy
(B) The decrease in mean free path
(C) The increase in collision frequency
(D) The increase in the number of molecules having more than the threshold energy

43. In the kinetic study of a reaction.
$A \longrightarrow$ Products
A straight line was observed when a graph between time and $1/C^2$ was plotted, the reaction is
(A) Second order (B) Third order
(C) Zero order (D) First order

44. Which of the following metals are usually used as catalyst?
(A) Alkali metals
(B) Coinage metals
(C) Alakline earth metals
(D) Transition metals

45. A substance which itself is not a catalyst but increases the activity of a catalyst is called
(A) Promoter (B) Poison
(C) Enzyme (D) Inhibitor

46. Which of the following techniques is used to measure absorption of radiation?
(A) Conductometry
(B) Polarimetry
(C) Spectrophotometry
(D) Dilatometry

47. Which of the following is not a true characteristic of a catalytic reaction?
(A) The amount and chemical composition of the catalyst remains unchanged after the reaction
(B) The catalyst does not initiate a chemical reaction

(C) The reaction in which products also act as catalysis are called autocatalysed reactions

(D) The catalyst shifts the equilibrium position of a reaction in a favorable direction

48. Which of the following statement is not related to collision theory?

(A) Molecules must collide with each other to do a chemical reaction

(B) Molecules must possess a minimum amount of energy

(C) Molecules must have proper orientation

(D) Collision theory is applicable to liquids only

49. The experimental relationship between rate of the reaction and concentration of the reactants is called

(A) Rate law

(B) Law of mass action

(C) Le-Chatelier's principle

(D) Rate constant

50. Which of the following expressions represent the Arrhenius equation?

(A) $k = e^{-E_a/RT}$ (B) $k = A\,e^{-E_a/R}$

(C) $k = A\,e^{-E_a/T}$ (D) $k = A\,e^{-E_a/RT}$

51. Which property of the liquid is measured by polarimetry?

(A) Conductance (B) Transmittance

(C) Absorbance

(D) Optical activity

52. Enzymes are

(A) Moulds

(B) Inorganic compounds

(C) Proteins

(D) Microorganisms

53. When reaction occurs in many steps, then slowest step is

(A) Mechanism step

(B) Enthalpy determining step

(C) Entropy determining step

(D) Rate determining step

54. Half life period of first order reaction depends on

(A) Concentration (B) Temperature

(C) Catalyst (D) All above

55. The maximum value of order can be

(A) 4 (B) 3

(C) 2 (D) 5

ANSWERS

1. C	2. D	3. D	4. A
5. B	6. D	7. B	8. A
9. D	10. C	11. A	12. D
13. B	14. D	15. B	16. B
17. C	18. C	19. B	20. D
21. B	22. D	23. B	24. B
25. C	26. C	27. A	28. C
29. B	30. C	31. B	32. B
33. C	34. A	35. D	36. D
37. B	38. B	39. A	40. A
41. C	42. D	43. B	44. D
45. A	46. C	47. D	48. D
49. A	50. D	51. D	52. C
53. D	54. B	55. A	

1.8. PHOTOCHEMISTRY AND MOLECULAR SYMMETRY

1. The branch of chemistry dealing with the study of reactions in the UV-visible region of the spectrum is known as
   (A) Kinetics
   (B) Photochemistry
   (C) Surface chemistry
   (D) Cryoscopy

2. The emission of light in a biological reaction is known as
   (A) Fluorescence
   (B) Phosphorescence
   (C) Bioluminescence
   (D) Chemiluminescence

3. The glow of yellow phosphorous as a result of slow oxidation in air is called
   (A) Chemiluminescene
   (B) Luminescence
   (C) Bioluminescence
   (D) Photolysis

4. The multiplicity of the electronic state is equal to
   (A) S + 1 (B) 2S + 1
   (C) 2S – 2 (D) 2S + 2

5. The mole of photon is known as
   (A) Quantum (B) Einstein
   (C) Energy Packet (D) None of above

6. A molecule returns from the excited singlet state to the ground singlet state with emission of light. This process is known as
   (A) Fluorescence (B) Scattering
   (C) Phosphorescence
   (D) Chemiluminescence

7. Which of the following reactions does not take place with light radiation?
   (A) Oxidation (B) Reduction
   (C) Polymerization
   (D) Double displacement

8. Which of the following statement is not true with respect to photochemical reactions?
   (A) These take place in the presence of light
   (B) Free energy of these reactions may be positive or negative
   (C) Light intensity affects these reactions
   (D) Temperature has significant affect on rate of these reactions

9. Which of the following statement is not related with high quantum yield reasons?
   (A) Formation of reactive intermediates which may act as catalyst
   (B) The active molecules may collide with other molecules and activate these molecules
   (C) The reaction may be exothermic and heat evolve may activate other molecules
   (D) The primary photochemical process may be reversed

10. A molecule goes from the excited singlet state to the triplet state without emitting light. The process is known as
    (A) Inter-system crossing
    (B) Fluorescence
    (C) Internal conversion
    (D) Phosphorescence

11. When a transition occurs between states of the same multiplicity without emitting light, the process is called
(A) Fluorescence (B) Quenching
(C) Internal conversion
(D) Intersystem crossing

12. A molecule returns from the first excited triplet sate to the ground state singlet. The light emitted is known as
(A) Inter-system crossing
(B) Fluorescence
(C) Phosphorescence
(D) Quenching

13. The quantum yield of a photochemical reaction is
(A) Always less than unity
(B) Always equal to unity
(C) Always greater than unity
(D) Can have any value > 0 depending on the reaction

14. According to the Grotthus-Draper law
(A) Only absorbed light is effective in producing photochemical changes
(B) Only light between certain wavelengths is effective in photochemical changes
(C) Light is effective only for photochemical reactions in solution
(D) The light absorbed is proportional to its intensity

15. Which of the following statements is correct?
(A) The wavelength of phosphorescence is less than the wavelength absorbed
(B) The transition from T_1 to S_0 without the emission of light is called phosphorescence
(C) The combination of CO_2 and water in plants, in the presence of chlorophyll, is an example of bioluminescence
(D) Population inversion is a necessary condition for laser action

16. The wavelength of fluorescent light is related to the wavelength of absorbed light (λ_f) by
(A) $\lambda_f > \lambda_{ab}$ (B) $\lambda_f < \lambda_{ab}$
(C) $\lambda_f \propto \lambda_{ab}$ (D) $\lambda_f \propto 1/\lambda_{ab}$

17. The value of an Einstein
(A) Is independent of wavelength
(B) Decreases with increase in wavelength
(C) Increases with increase in wavelength
(D) Depends on the temperature of the absorbing system

18. The extinction coefficient has the units
(A) $cm^2\ mol^{-1}$ (B) $cm^3\ mol^{-1}$
(C) $mol\ cm^{-2}$ (D) $mol\ cm^{-3}$

19. The Lambert-Beer law states that
(A) Transmission is directly proportional to path length
(B) Transmission is directly proportional to concentration
(C) Absorbance is inversely proportional to transmission
(D) Absorbance is directly proportional to concentration

20. Reactions in which molecule absorbing light do not themsely react but induce other molecules react are called
(A) Chain reactions
(B) Photosensitized reactions
(C) Reversible reactions
(D) Free radical reactions

21. "Only those radiations w absorbed by the system about chemical change." statement of the
(A) Beer-Lambert law
(B) Grotthus-Draper lav
(C) Einstein law
(D) Photochemical equ

22. The reverse of a photochemical reaction is called
(A) Phosphorescence
(B) Chemiluminescence
(C) Fluorescence
(D) Photosensitization

23. A line, a point or a plane about which a symmetry operation is performed, is known as
(A) Symmetry operation
(B) Symmetry element
(C) Reflection (D) Inversion

24. Which of the following item is not symmetry element?
(A) Plane of symmetry
(B) Inversion centre
(C) Improper rotation
(D) Optical activity

25. Which of the following symmetry element leaves the molecule or an object unchanged?
(A) Proper rotation
(B) Improper rotation
(C) Inversion axis (D) Identity

26. In proper rotation (C_n), an object is rotated through an angle of
(A) π/n radians (B) $2\pi/n$ radians
(C) $3\pi/n$ radians (D) $4\pi/n$ radians

27. Which of the following symmetry operations is not correct?
(A) $\sigma^2 = E$ (B) $i^2 = E$
(C) $\vec{C}_3 \times \vec{C}_3 = \overleftarrow{C}_3$ (D) $\vec{C}_3 = \overleftarrow{C}_3$

In C_4-axis of rotation, an object is
'otated through an angle of
') 120° (B) 180°
100° (D) 90°

ar molecules have ——— axis of
on
(B) C_2
(L (D) C_∞

30. Which of the following molecules have centre of symmetry?
(A) H_2O (B) HCl
(C) CO_2 (D) H_2SO_4

31. Which of the following statement is not correct with respect to group theory?
(A) Two elements of a group combine to form a third element of a group
(B) An element combines with itself to form another element of the group
(C) Each element of the group obey associative law of combination
(D) Each group element has no reciprocal

32. Which of the following symmetry operations is not correct according to group theory?
(A) $C_2 \cdot \sigma_v = \sigma_v'$ (B) $\sigma_v \cdot \sigma_d = \sigma_v$
(C) $i^2 = E$ (D) $C_2E = EC_2$

33. Which of the following molecules belongs to C_{3V} point group?
(A) H_2O (B) H_2S
(C) BF_3 (D) NH_3

34. CO belong to which group?
(A) C_{2v} (B) D_{2h}
(C) $C_{\infty v}$ (D) $D_{\infty h}$

35. Ethylene belongs to
(A) C_{2v} group (B) D_{2h} group
(C) C_{2v} group (D) $D_{\infty h}$ group

36. Methane belongs to
(A) Octahedral group
(B) Tetrahedral group
(C) Special group (D) $D_{\infty h}$

37. How many planes of symmetry are present in benzene?
(A) 1 plane (B) 3 planes
(C) 5 planes (D) 6 planes

38. PF_5 belongs to which point group

(A) D_{2h} (B) D_{3h}

(C) D_{5h} (D) D_{4h}

39. The point group of $XeOF_4$ is

(A) C_{6v} (B) C_{4v}

(C) D_{4h} (D) D_{2h}

40. Which of the following molecules possess horizontal mirror plane?

(A) Ammonia (B) Water

(C) BF_3 (D) H_2S

ANSWERS

1. B	2. C	3. A	4. B
5. B	6. A	7. D	8. D
9. D	10. A	11. C	12. C
13. D	14. A	15. A	16. A
17. B	18. A	19. D	20. B
21. B	22. B	23. B	24. D
25. D	26. B	27. D	28. D
29. D	30. C	31. D	32. B
33. D	34. C	35. B	36. B
37. D	38. B	39. B	40. C

1.9. ELECTROCHEMISTRY

1. Which of the following solids is a better conductor of electricity?
(A) Pure NaCl crystals
(B) Diamond
(C) Graphite
(D) Marble pieces

2. The branch of chemistry which is concerned with the interrelation of electrical and chemical energy is called
(A) Reaction dynamics
(B) Electrochemistry
(C) Surface chemistry
(D) Kinetics

3. The device that converts the chemical energy of fuel directly into electrical energy is called
(A) Galvanic cell
(B) Electrolytic cell
(C) Fuel cell
(D) Concentration cell

4. Which of the following relation corresponds to Faradays' law of electrolysis?
(A) $m = ZIt$
(B) $E = mc^2$
(C) $E = h\upsilon$
(D) $\Delta F^\circ = -nFE^\circ$

5. When some quantity of electricity is passed through two electrolytic cells, the ratio of the mass of the products obtained at the cathode is the same as the ratio of their
(A) Densities
(B) Atomic masses
(C) Equivalent masses
(D) Atomic numbers

6. The blue color of $CuSO_4$ disappears on adding Zn granules to it. It is because of
(A) Oxidation of Cu atom
(B) Oxidation of Zn^{2+}
(C) Reduction of Cu^{2+}
(D) Reduction of Zn^{2+}

7. Which of the following statements is not true with reference to ionic conductors?
(A) Ionic conductance is due to movement of the ions
(B) It involves the transfer of matter
(C) It involves oxidation reduction reaction
(D) It decreases with rise in temperature

8. The expression of specific conductance is given by
(A) $Ls = \frac{2}{R} \cdot \frac{l}{A}$
(B) $Ls = L \cdot \frac{l}{A}$
(C) $Ls = \frac{1}{L} \cdot \frac{A}{l}$
(D) $Ls = R \cdot \frac{l}{A}$

9. The units of specific conductance will be
(A) $S\ cm^{-1}$
(B) Ohm cm
(C) Ohm cm^{-1}
(D) Mho cm

10. The conductance of 1 cm^3 of an electrolyte solution is called its
(A) Specific resistance
(B) Specific conductance
(C) Molar conductance
(D) Equivalent conductance

11. Which of the following expressions represent the equivalent conductance?
(A) $\Lambda = \frac{Ls \times 1000}{V}$
(B) $\Lambda = \frac{Ls \times 1000}{C}$
(C) $\Lambda = Ls \cdot \frac{l}{A}$
(D) $\Lambda = Ls/V$

12. Which of the following statement is not correct with reference to cell constant?
(A) The dimensions of cell constant is cm^{-1}
(B) It is used to determine the specific conductance
(C) It is measured with KCl solution
(D) Specific conductance does not vary with concentration

13. Which of the following statement is not correct with reference to Arrhenius theory of electrolytic dissociation?
(A) Electrolytes dissociate into charged species called ions in aqueous solution
(B) The extent of dissociation depends on the concentration of the electrolyte
(C) The extent of dissociation also depends on the temperature of the electrolyte
(D) The ions are not free to move

14. Electrolytic conduction is due to the movement of
(A) Electrons (B) Ions
(C) Atoms
(D) Electrons as well as ions

15. Which of the following solutions of NaCl will have the highest specific conductance?
(A) 0.001 N (B) 0.01 N
(C) 0.1 N (D) 1.0 N

16. Equivalent conductance can be expressed in terms of specific conductance (k) and concentration (C) gram equivalent per dm^{-3} as
(A) $k \times C$ (B) $\frac{k \times 1000}{C}$
(C) $\frac{k \times C}{1000}$ (D) $k \times C \times 1000$

17. Which of the following ions has high mobility in aqueous solution?
(A) H^+ (B) K^+
(C) Ca^{++} (D) None of above

18. Equivalent conductance is expressed in the units
(A) $S\ cm^{-1}\ eq^{-1}$ (B) $S\ cm\ eq^{-1}$
(C) $S\ cm^2\ eq^{-1}$ (D) $S\ cm^2\ eq$

19. The fraction of the total current carried by an ion is called its
(A) Ionic mobility
(B) Transport number
(C) Limiting ionic conductance
(D) None of these

20. Which of the following process always involve decrease in oxidation number?
(A) Hydrolysis (B) Reduction
(C) Oxidation (D) Decomposition

21. If for a solution of an electrolyte, t_+ is the transport number of the cation, then the transport number of the anion t_- is equal to
(A) $t_+/2$ (B) $1 - t_+$
(C) $1 + t_+$ (D) $(1 - t)/2$

22. If $\wedge_c$ is the equivalent conductance at concentration C and $\wedge^o$ is the limiting equivalent conductance, the degree of dissociation α is
(A) $\alpha = \wedge^o - \wedge_c$ (B) $\alpha = I - \frac{\wedge_c}{\wedge^o}$
(C) $\alpha = \frac{\wedge_c}{\wedge^o}$ (D) $\alpha = \frac{\wedge^o - \wedge_c}{\wedge^o}$

23. Which of the following relations expresses Kohlrausch's law?
(A) $\alpha = \frac{\wedge}{\wedge^o}$ (B) $t_+^o \times \wedge^o = \lambda_+^o$
(C) $\lambda_+^o = \wedge^o - \lambda_-^o$ (D) $\wedge^o = \lambda_+^o/96500$

24. During a reaction of copper with aqueous solution of silver nitrate
(A) Silver atoms are reduced
(B) Cu^{++} ions are reduced
(C) Silver ions are reduced
(D) Nitrate ions are reduced

25. If in a solution of 1 – 1 electrolytes, u_+ and u_- are the velocities of cations and anions, respectively, the transport number of cations is equal to
(A) $\frac{u_+}{u_+ + u_-}$
(B) $\frac{u_-}{u_+ + u_-}$
(C) $\frac{u_+ - u_-}{u_+}$
(D) $1 - \frac{u_+}{u_+ - u_-}$

26. Which of the following statement is correct?
(A) The transport number of a cation is equal to its equivalent conductance
(B) The sum of the transport numbers of all the ions present is a solution in unity
(C) The transport number of an ion is inversely proportional to its mobility
(D) The transport number of a cation is equal to that of the anion

27. The correct units for the cell constant are
(A) $\Omega^{-1}\ cm^{-1}$
(B) cm^{-1}
(C) cm^2
(D) $\Omega\ cm^{-1}$

28. In which of the following compounds the oxidation no. of Cl is +3?
(A) ICl
(B) ClO_3^-
(C) ClF_3
(D) $HClO_4$

29. During the titration of weak acid against NaOH, the conductance of the solution after the neutralization point
(A) Is constant
(B) Decreases
(C) Varies irregularly
(D) Increases

30. According to the Debye-Huckel theory of strong electrolytes, an ion moving in an atmosphere of oppositely charged ions experiences a drag. This effect is known as
(A) Asymmetric effect
(B) Electrophoretic effect
(C) Inter-ionic effect
(D) Concentration effect

31. The oxidation no of I in HIO_4 is
(A) +7
(B) +6
(C) +5
(D) +3

32. The equivalent conductance ($\wedge$) and molar conductance ($\wedge_m$) of $BaSO_4$ are related as
(A) $\wedge = \frac{\wedge_m}{2}$
(B) $\frac{\wedge}{2} = \wedge_m$
(C) $\wedge = \wedge_m$
(D) $\wedge = \frac{\wedge_m}{4}$

33. Which of the following process always involve the decrease in oxidation number?
(A) Hydrolysis
(B) Decomposition
(C) Oxidation
(D) Reduction

34. The oxidation no of oxygen in PbO_2 is
(A) +3
(B) +2
(C) -1
(D) -2

35. The oxidation number of I in HIO_4 is
(A) +7
(B) +6
(C) +3
(D) +14

36. In which of the following compound, valency of carbon is 4 but its oxidation number is zero
(A) Methane
(B) Carbon dioxide
(C) Carbon monoxide
(D) Formaldehyde

37. The species undergoing reduction in the following reaction is
$Cr + 2H_2O + ClO^- \rightarrow Cr^{3+} + 3Cl^- + 6OH^-$
(A) Cr
(B) H_2O
(C) ClO^-
(D) Cl^-

38. Which of the following reaction is not a redox reaction?
(A) $SO_2 + 2H_2S \longrightarrow 2H_2O + S$
(B) $2Na + O_2 \longrightarrow Na_2O_2$
(C) $Na_2O + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
(D) $NO_2 + 2H_2S \longrightarrow 2H_2O + N$

39. Which of the following is a cathodic reaction?
(A) $Fe^{2+} \longrightarrow Fe^{3+}$
(B) $4OH^- \longrightarrow 2H_2O + O_2$
(C) $2H_2O \longrightarrow 2OH^- + H_2$
(D) $2SO_4^{2-} \longrightarrow S_2O_8^{2-}$

40. Which of the following electrodes has $E^o_{red} = 0$?
(A) $H_2/2H^+$, Pt (B) Cl_2/Cl^-, Pt
(C) $Cl_2/Ag^+, Ag^+_{(aq)}$ (D) Cu^{2+}/Cu

41. From the knowledge of activity series, the best reducing agent among the following is?
(A) F^- ions (B) Cl^- ions
(C) Br^- ions (D) I^- ions

42. In the cell reaction
$Cu_{(s)} + 2Ag^+_{(aq)} \longrightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$
the reduction half reaction is
(A) $Cu_{(s)} - 2e \longrightarrow Cu^{2+}_{(aq)}$
(B) $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$
(C) $2Ag_{(s)} \longrightarrow 2Ag^+_{(aq)} + 2e$
(D) $2Ag^+_{(aq)} + 2e \longrightarrow 2Ag_{(s)}$

43. Free energy change (ΔG) is related to the e.m.f. of a cell (E) as
(A) $\Delta G = -\frac{RT}{nF} \text{ in } E$ (B) $\Delta G = -nFE$
(C) $E = -nF\Delta G$ (D) $\Delta G = -\frac{nFE}{RT}$

44. According to the latest convention, the e.m.f. of a cell may be expressed in terms of the reduction potentials RHS electrode (E_R) and LHS electrode (E_L) as
(A) $E_{cell} = E_L - E_R$ (B) $E_{cell} = E_R - E_L$
(C) $E_{cell} = E_R + E_L$ (D) $E_{cell} = E_R/E_L$

45. Which of the following statement is not correct regarding galvanic cells?
(A) Oxidation occurs at the anode
(B) Ions carry current inside the cell
(C) Electrons flow around the external circuit, from cathode to anode
(D) When the e.m.f. of the cell is positive cell reaction is spontaneous

46. The electrode $Pt/Fe^{2+}(C_1)$, $Fe^{3+}(C_2)$ belongs to the type
(A) Gas electrodes
(B) Inert metal electrodes
(C) Amalgam electrodes
(D) Metal-metal insoluble salt electrode

47. Oxidation number of S in H_2SO_4 is
(A) +2 (B) +4
(C) +6 (D) +8

48. The equilibrium constant (K) for a cell reaction can be calculated from the e.m.f. of the cell (E°) by the relation
(A) $K = \frac{2.303\ RT}{nF} \log E°$
(B) $\log K = \frac{nFE°}{2.303\ RT}$
(C) $K = \frac{2.303\ RT}{nFE°}$
(D) $K = \frac{2.303\ nF}{RT} \log E°$

49. The mathematical equation
$E - E° = -\frac{RT}{nF} \ln Q$
where Q is the reaction quotient, is called

(A) Helmholtz equation
(B) Free energy equation
(C) Nernst equation
(D) Newton's equation

50. The emf of the cell $Zn|Zn^{2+}||Ag^{+}|Ag$ is independent of
(A) The volume of Zn^{2+} and Ag^{+} solutions
(B) The molarity of Zn^{2+} ions in the solution
(C) The molarity of Ag^{+} ions in the solution
(D) Temperature

51. For which of the following cells, the standard voltage is zero
(A) Daniel cell
(B) Concentration cell
(C) Electrolytic cell
(D) Fuel cell

52. The depolarizer used in dry cell batteries is
(A) NH_4Cl (B) MnO_2
(C) KOH (D) Na_3PO_4

53. In lead storage battery, the anode reaction is
(A) $Pb^{2+} + 2e^{-} \longrightarrow Pb$
(B) $Pb + H_2SO_4 \rightarrow PbSO_4 + 2H^{+} + 2e^{-}$
(C) $PbO + H_2SO_4 \longrightarrow PbSO_4 + H_2O$
(D) None of these

54. The burning of hydrogen in the atmosphere of oxygen to form water can be described as
(A) Redox reaction (B) Reduction only
(C) Hydrogenation of oxygen
(D) Oxidation only

55. Reaction taking place at anode is
(A) Oxidation (B) Reduction
(C) Hydrolysis (D) Ionization

56. A half cell reaction is one that
(A) Occurs at one electrode
(B) Goes only half way to completion
(C) Involves a half mole of the concentration of the solution
(D) Always oxidizes

57. The oxidation state of carbon in sucrose is
(A) +4 (B) +3
(C) -4 (D) Zero

58. Which of the following metals cannot displace copper from copper sulphate solution?
(A) Iron (B) Aluminium
(C) Sodium (D) Magnesium

59. Cell potential depends on
(A) Temperature
(B) Concentration of ions
(C) Nature of electrolyte
(D) All above

60. Concentration polarization arises because of the
(A) Different concentrations of solutions in the two half cells
(B) Changes in the concentration of electrolyte around the electrode from bulk concentration
(C) Reversible nature of the cell
(D) Variation in temperature during measurements

61. In a standard Weston cell, the cathode is
(A) Cadmium amalgam
(B) Mercury (C) Platinum
(D) Carbon

62. Overall positive value of cell potential predicts that the process is
(A) Impossible (B) Reversible
(C) Feasible (D) Not feasible

63. Which of the following is a primary cell?
(A) Fuel cell
(B) Lead accumulator
(C) Daniel cell
(D) Alkaline dry cell

64. In superoxide, the oxidation number of oxygen is

(A) Zero (B) –1
(C) +1 (D) –1/2

65. Which of the following has same oxidation state in all of its compounds?

(A) N (B) Cl
(C) P (D) Be

66. The cell in which a non-spontaneous redox reaction takes place as a result of electricity is know as

(A) Voltaic cell
(B) Electrolytic cell
(C) Daniel cell (D) Dry cell

67. In which compound the oxidation state of Cl is +5

(A) NaCl (B) HOCl
(C) $NaClO_3$ (D) $NaClO_4$

68. When brine solution is electrolyzed which of the following ions get discharged at anode?

(A) Cl^- (B) OH^-
(C) H^+ (D) Na^+

69. Which of the following is not reduction?

(A) Gain of electron
(B) Gain of hydrogen
(C) Loss of oxygen
(D) Decrease in negative oxidation state

70. In silver oxide battery anode is made up of

(A) Zn (B) Cd
(C) Ag_2O (D) NiO_2

ANSWERS

1. C	2. B	3. C	4. A
5. C	6. C	7. D	8. B
9. A	10. B	11. B	12. D
13. D	14. B	15. D	16. B
17. B	18. C	19. B	20. B
21. B	22. C	23. C	24. C
25. A	26. B	27. B	28. C
29. D	30. A	31. A	32. A
33. D	34. C	35. A	36. D
37. C	38. C	39. C	40. A
41. D	42. D	43. B	44. B
45. C	46. B	47. C	48. B
49. C	50. A	51. B	52. B
53. B	54. A	55. A	56. A
57. D	58. A	59. D	60. B
61. B	62. C	63. D	64. D
65. D	66. B	67. C	68. A
69. B	70. A		

1.10. COLLOIDS AND POLYMERS

1. A system is said to be in the colloidal state if the particle size of the dispersed phase ranges from
   (A) 1 to 10 Å (B) 10 to 100 Å
   (C) 10 to 10000 Å
   (D) 1000 to 10000 Å

2. Which of the following statement is false regarding lyophilic sols?
   (A) The colloidal particles show a liking for the dispersion medium
   (B) These are generally easy to prepare
   (C) These are more stable than lyophobic sols
   (D) The stability of the sols is mainly due to the electrical double layer

3. Which one of the following is the cause of Brownian movement of colloidal particles?
   (A) Convection currents in the fluid
   (B) Bombardment by the molecules of the dispersion medium
   (C) Settling of dispersed phase under gravity
   (D) Thermal gradient in the medium

4. Colloids can be purified by
   (A) Peptization (B) Coagulation
   (C) The Breeding arc method
   (D) Dialysis

5. Which of the following colligative properties can be used to characterize colloidal particles?
   (A) Lowering in vapour pressure
   (B) Elevation in boiling point
   (C) Depression in freezing point
   (D) Osmotic pressure

6. The process of removing dissolved impurities from a colloidal system, by means of diffusion through a suitable membrane under the influence of an electric field, is called
   (A) Electrosmosis (B) Electrodialysis
   (C) Electrophoresis (D) Peptization

7. The migration of positively charged colloidal particles, under an electrical field, towards the cathode is called
   (A) Cataphoresis (B) Electrosmosis
   (C) Sedimentation (D) Electrodialysis

8. Smoke is a dispersion of
   (A) Gas in gas (B) Gas in solid
   (C) Solid in gas (D) Liquid in gas

9. In the process of electrosmosis
   (A) Colloidal particles move towards the electrodes
   (B) Both, colloidal particles and dispersion medium move
   (C) Only dispersion medium moves to carry the current
   (D) Positively charged colloidal particles move, but negatively charged particles remain stationary

10. When a strong beam of light is passed through a colloidal solution, the light will
   (A) Be reflected (B) Be scattered
   (C) Pass unchanged
   (D) Be dispersed

11. Which of the following electrolytes will be most effective in the coagulation of arsenious sulphide sol?
   (A) $NaNO_3$ (B) $MgSO_4$
   (C) $AlPO_4$ (D) $K_4[Fe(CN)_6]$

12. The stabilization of the dispersed phase in a lyophobic sol is due to
(A) Liking for the dispersion medium
(B) The surface tension of the medium
(C) The formation of an electrical layer between the two phases
(D) The viscosity of the medium

13. Which of the following will be most effective in the coagulation of $Fe(OH)_3$ sol?
(A) NaCl
(B) $MgSO_4$
(C) $Mg_3(PO_4)_2$
(D) $AlCl_3$

14. A silver iodide sol was prepared by mixing KI and $AgNO_2$ solutions with the $AgNO_2$ in slight excess. Which of the following descriptions is correct regarding is sol particles.
(A) Negatively charged because of the excess of NO_3^- ions
(B) Positively charged because of the excess of Ag^+ ions in the AgI lattice
(C) Negatively charged because I^- ions are adsorbed from the KI solution
(D) Neutral

15. An emulsifler is an agent which
(A) Stabilizes an emulsion
(B) Homgeneises an emulsion
(C) Causes coagulation of an emulsion
(D) Helps in the formation of an emulsion

16. A colloidal system in which a liquid is dispersed in a solid is called a/an
(A) Emulsion
(B) Sol
(C) Gel
(D) Precipitate

17. The gold numbers of some hydrophilic substances are
Gelatin 0.005 – 0.01
Egg albumen 0.08 – 0.10
Gum Arabic 0.10 – 0.15
Soluble starch 10 – 15
which of the these will act best as a protective colloid?
(A) Gelatin
(B) Egg albumen
(C) Soluble starch
(D) Gum Arabic

18. The Tyndall effect was used by Zsigmondy to devise
(A) The ultramicroscope
(B) The ultracentrifuge
(C) The osmometer
(D) Electrodialysis

19. Which of the following can act as a protective colloid?
(A) Gelatin
(B) Silica gel
(C) Oil-in-water emulsion
(D) All three

20. The process of passing of a precipitate into colloidal solution, on adding an electrolyte, is called
(A) Dialysis
(B) Peptization
(C) Electrophoresis
(D) Electrosmosis

21. The Tyndall effect is not observed in
(A) Suspensions
(B) Emulsions
(C) Colloidal solutions
(D) True solutions

22. The colloidal solution of arsenic sulphide prefers to absorb
(A) NO_3^-
(B) K^+
(C) S^{2-}
(D) H^+

23. If a freshly formed precipitate of stannic oxide is peptised by a small amount of sodium hydroxide, the colloidal particles may be represented as
(A) $[SnO_2]\ Sn^{4+} : OH^-$
(B) $[SnO_2]\ SnO_3^{2-} : 2Na^+$
(C) $[SnO_2]\ Sn^{4+} : \leftarrow O^{2-}$
(D) $[SnO_2]\ Na^+ : OH^-$

24. Which of the following statement is not correct regarding the Stern theory of charge on colloidal particles?
   (A) The colloidal particle has a charge distribution at its surface
   (B) In the immediate vicinity of the colloidal particles there is an excess of counter ions
   (C) The greater the concentration and charge of ions in the diffused electrical double layer, the larger is the thickness of the layer
   (D) At large distance from the colloidal particles, the concentrations of co-ions and counter-ions are almost equal

25. In emulsions, the dispersed phase and the dispersion medium are
   (A) Both solids (B) Both liquids
   (C) Both gases
   (D) Phase is liquid and medium is solid

26. Which of the following polymers is prepared by addition polymerization technique?
   (A) Cellulose (B) Polyethylene
   (C) Nylon (D) Starch

27. Which of the following methods gives the number-average molecular weight of a polymer?
   (A) Light scattering method
   (B) Osmotic method
   (C) Sedimentation equilibrium method
   (D) Viscosity method

28. Which of the following is a natural polymer
   (A) Nylon (B) Leucite
   (C) Cellulose (D) Polystyrene

29. Which of the following statements is not correct regarding the structure of DNA?
   (A) It has a double helix structure
   (B) There are hydrogen bonds in its structure
   (C) Unlike RNA, there is no fixed ratio of bases in DNA
   (D) The code for protein synthesis is given by the sequence of bases in DNA

30. For monodisperse systems
   (A) $\overline{M}_n > \overline{M}_w$ (B) $\overline{M}_w > \overline{M}_n$
   (C) $\overline{M}_n = \overline{M}_w$ (D) $\overline{M}_n \geq \overline{M}_w$

31. The intrinsic viscosity is related to the molecular weight (M) by the relation (k and α are constants)
   (A) $\eta_{int} = kM^{\alpha}$ (B) $\eta_{int}/M = K^{\alpha}$
   (C) $\eta_{int} = kM\, e^{\alpha}$ (D) $\eta_{int} = Ke^{\alpha}M$

32. Which of the following methods does not give the weight-average molecular weight?
   (A) Sedimentation equilibrium
   (B) Sedimentation velocity
   (C) Light scattering
   (D) Osmotic method

33. In the osmotic method for the determination of molecular weight of polymers, molecular weight can be calculated from the intercept of the
   (A) π versus c graph
   (B) π/c versus c graph
   (C) π/c versus RT/M graph
   (D) π/c versus 1/M graph

34. A colloidal system in which both the dispersion phase and dispersed phase are liquid is
   (A) Smoke (B) Emulsion
   (C) Whipped cream
   (D) Mist

35. Which of the following polymers is prepared by condensation polymerization technique?
   (A) Polystyrene (B) Polyethylene
   (C) Nylon (D) Starch

36. A high polymer is one in which the number of repeating units is in excess of about
(A) 10 (B) 100
(C) 1000 (D) None of above
37. The number of repeat units in poymer backbone is known as
(A) Degree of ionization
(B) Degree of polymerization
(C) Degree of dissociation
(D) None of above
38. The polymers which take on new shapes by the application of heat and pressure are known as
(A) Copolymers (B) Thermosets
(C) Thermoplastics
(D) None of above
39. The polymers which donot soften by heat and pressure are known as
(A) Copolymers (B) Thermosets
(C) Thermoplastics
(D) None of above
40. Stereochemical configuration of a vinyl type polymer may be
(A) Isotactic (B) Syndiotactic
(C) Atactic (D) All of above
41. High density polyethylene (HDP) can be produced under normal conditions of temperature and pressure using
(A) Pt (B) Ni
(C) V
(D) Zeigler-Natta catalyst
42. Urea-formaldehyde resin belong to class of polymers known as
(A) Fibres (B) Thermosetts
(C) Thermoplastics
(D) Plasticizer
43. Polyesters belong to class of polymers known as
(A) Plasticizer (B) Thermosetts
(C) Thermoplastics
(D) Fibres
44. PVC belongs to class of polymers known as
(A) Fibres (B) Thermosetts
(C) Thermoplastics
(D) Plasticizer
45. What types of forces are present in polymers?
(A) H-bonding
(B) Dipole-dipole forces
(C) van der Waals forces
(D) All above
46. Which of the following macromolecules are cross-linked?
(A) Polyesters (B) Polyamides
(C) High density polyethylene
(D) Polyurethanes
47. Which of the following polymer is copolymer?
(A) Polyethylene (B) Polystyrene
(C) PVC (D) SBR
48. Which of the following compounds acts as free radical initiator?
(A) Lewis acid (B) Carbocations
(C) High energy radiation
(D) Peroxides
49. Which of the following compounds acts as cationic initiator?
(A) Lewis acid (B) Carbocations
(C) High energy radiation
(D) Peroxides
50. Which of the following compounds acts as anionic initiator?
(A) Lewis acid (B) Lewis bases
(C) High energy radiation
(D) Peroxides

ANSWERS

1. C	2. D	3. B	4. D
5. D	6. B	7. A	8. C
9. C	10. B	11. C	12. C
13. D	14. B	15. A	16. C
17. A	18. A	19. A	20. B
21. D	22. C	23. B	24. C
25. B	26. B	27. B	28. C
29. C	30. C	31. A	32. D
33. B	34. B	35. C	36. C
37. B	38. C	39. B	40. D
41. D	42. B	43. D	44. C
45. D	46. D	47. D	48 D
49. A	50. B		

1.11. SURFACE CHEMISTRY AND CATALYSIS

1. The enrichment of chemical substances at the surface of a solid is called
   (A) Adsorption (B) Absorption
   (C) Sorption (D) Isotherm

2. The substance on whose surface adsorption takes place is called the
   (A) Absorbent (B) Adsorbate
   (C) Active substance
   (D) Porous substance

3. Which of the following characteristics of adsorption is wrong?
   (A) Adsorption on solids is reversible in nature
   (B) Adsorption, in general increase with increase in temperature
   (C) Adsorption is generally selective in nature
   (D) Both enthalpy and entropy of adsorption are negative

4. In terms of the amount of the substance adsorbed per gram of the adsorbent (x/m), and pressure p of the gas, the Freudlich adsorption isotherm is represented as
   (A) $\frac{x}{m} = \frac{k}{p^n}$ (B) $\frac{x}{m} = kp^n$
   (C) $p = k\left(\frac{x}{m}\right)^n$ (D) $\frac{x}{m} = \left(\frac{k}{p}\right)^n$

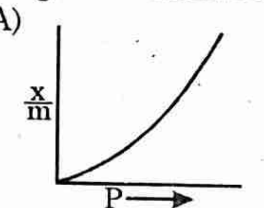
5. The Langmuir adsorption isotherm shows that the amount of adsorbed gas per gram of the solid is equal to
   (A) $\frac{ap}{1 + bp}$ (B) $\frac{ap + 1}{1 - bp}$
   (C) $\frac{1 + ap}{1 - bp}$ (D) $a(1 + bp)$

6. According to the Langumir isotherm, when the pressure of the gas is very large, the adsorption
   (A) Is directly proportional to pressure
   (B) Is inversely proportional to pressure
   (C) Is directly proportional to the square of the pressure
   (D) Is independent of pressure

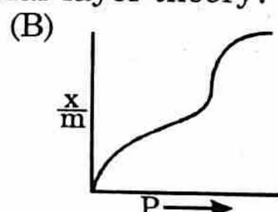
7. If θ is the fraction of the surface occupied by adsorbate molecules at equilibrium, then according to the Langmuir theory, the rate of condensation is given by
   (A) $\alpha\theta$ (B) $\alpha\theta\, p$
   (C) $\alpha(1 - \theta)p$ (D) $\alpha(1 - \theta)$

8. Which of the following isotherms was successfully explained by the Langmuir unimolecular layer theory?

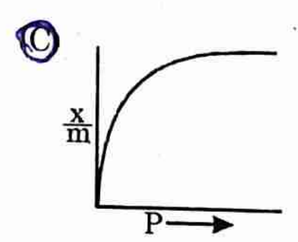
(A)



(B)



(C)



(D)

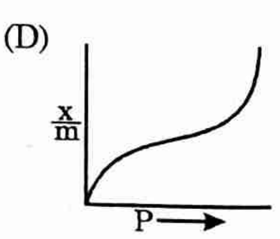


Fig. 11.1

9. In the Langmuir adsorption isotherm, when $p \to 0$, the amount of substance adsorbed per gram of the adsorbent is proportional to
   (A) p^2 (B) $1/p$
   (C) p (D) p^0

10. The kinetics of the decomposition of ammonia on the tungsten surface follows
(A) Zero order (B) First order
(C) Second order (D) Third order

11. Retarded reaction is that
(A) In which the rate of the reaction is independent of pressure
(B) In which products are strongly adsorbed on the surface of the solid catalyst
(C) Which are reversible under all conditions?
(D) For which ΔG is positive

12. Which of the following is not true for physical adsorption?
(A) It is reversible
(B) It needs activation energy
(C) It occurs in the form of multilayer
(D) It increases with increase of P

13. The adsorption theory can explain the action of all these except
(A) Heterogeneous catalysis
(B) Catalytic poisons
(C) Acid-base catalysis
(D) Promoters

14. Catalytic poisons act by
(A) Getting adsorbed on active centres on the catalyst surface
(B) Chemical combination with any one of the reactants
(C) Increasing the rate of the backward reaction
(D) Making the products inert

15. For adsorption enthalpy change is
(A) Positive (B) Zero
(C) Negative (D) None of above

16. The adsorption theory explains
(A) Homogeneous catalysis
(B) Acid-base catalysis
(C) Heterogeneous catalysis
(D) Enzyme catalysis

17. In adsorption of methane on charcoal, charcoal is
(A) Adsorbate (B) Adsorbent
(C) Catalyst (D) None of above

18. A substance which lowers the catalytic activity of a catalyst is called a/an
(A) Autocatalyst
(B) Negative catalyst
(C) Promoter (D) Poison

19. The Langmuir theory of unimolecular adsorption is generally valid at
(A) Low pressures and low temperatures
(B) Low pressures and high temperatures
(C) High pressures and low temperatures
(D) High pressures and high temperatures

20. Which of the following state is not correct regarding Langmunir adsorption theory?
(A) Adsorbent has specific equivalent sites
(B) One site can adsorbs only one molecule
(C) Adsorbed molecules cannot interact with each other
(D) Adsorption is a static process

21. A graph of extent of adsorption vs pressure at constant temperature is called
(A) Adsorption isostere
(B) Adsorption isobar
(C) Adsorption isotherm
(D) None of above

22. A graph of extent of adsorption vs temperature at constant P is called
(A) Adsorption isostere
(B) Adsorption isobar
(C) Adsorption isotherm
(D) None of above

23. Dyeing of cotton is an example of
(A) Adsorption (B) Absorption
(C) Sorption (D) None of above

24. Which of the following statements is true regarding chemisorptions?
(A) It is reversible in nature
(B) It is not specific in nature
(C) It is monolayeric in nature
(D) It occurs at low temperature

25. Which of the following isotherm model explain chemical adsorption?
(A) Freundlich isotherm
(B) BET isotherm
(C) Langmuir isotherm
(D) None of above

26. Pd is a good adsorbent for
(A) CO (B) CO_2
(C) SO_2 (D) H_2

27. The heat of adsorption for physical adsorption is generally in the range of
(A) 20-40 kJ (B) 40-60 kJ
(C) 100-150 kJ (D) None of above

28. The heat of adsorption for chemical adsorption is generally in the range of
(A) 20-40 kJ (B) 40-400 kJ
(C) 1000-1500 kJ (D) None of above

29. Simultaneous occurrence of both adsorption and absorption is called
(A) Occlusion
(B) Physical adsorption
(C) Chemical adsorption
(D) Sorption

30. The extent of adsorption is affected by which factor(s)
(A) Surface area (B) Temperature
(C) Pressure (D) All above

ANSWERS

1. A	2. A	3. B	4. B
5. A	6. D	7. C	8. C
9. C	10. A	11. B	12. B
13. C	14. A	15. C	16. C
17. B	18. D	19. B	20. D
21. C	22. B	23. C	24. C
25. C	26. D	27. A	28. B
29. D	30. D		

1.12. SPECTROSCOPY

1. The energy associated with photon of light is
(A) $c = \upsilon\lambda$ (B) $E = hc$
(C) $E = h\upsilon$ (D) $E = mc^2$

2. The commonly used units for wavelength is
(A) Centimetre (B) Micrometre
(C) Nanometre (D) All above

3. Which of the following radiation has larger wavelength?
(A) Gamma rays (B) Ultraviolet
(C) Microwave (D) Radio wave

4. Which of the following radiation has high energy?
(A) Ultraviolet (B) Microwaves
(C) Visible (D) Radiowaves

5. Which of the following radiation has high frequency?
(A) Radiowaves (B) Microwaves
(C) Infrared (D) γ-rays

6. What types of energy is possessed by molecules in the gases state?
(A) Translational energy
(B) Vibrational energy
(C) Rotational energy (D) All above

7. Which of the following radiation has rotational phenomenon?
(A) Microwave (B) Infrared
(C) Visible (D) X-rays

8. Which of the following radiation has vibrational transitions?
(A) X-rays (B) γ-rays
(C) Microwave (D) Infrared

9. Which of the following radiation has valence electron transitions?
(A) Visible (B) X-rays
(C) γ-rays (D) Microwave

10. Which of the following molecule is not symmetric top?
(A) BF_3 (B) BCl_3
(C) CH_3Cl (D) H_2O

11. When all the three principal moments of inertia of a molecule are equal, it is called
(A) Symmetric top
(B) Prolate symmetric top
(C) Spherical top
(D) Asymmetric top

12. Which of the following information is obtained from rotational spectra of a molecule?
(A) Molecular structure
(B) Dipole moment (C) Atomic mass
(D) All above

13. The selection rule for transition in vibrational energy levels in IR spectrum is
(A) $\Delta v = \pm 1$ (B) $\Delta v = \pm 2$
(C) $\Delta v = \pm 3$ (D) $\Delta v = \pm 4$

14. Which of the following technique is used for functional group identification?
(A) Rotational spectroscopy
(B) Electronic spectroscopy
(C) NMR spectroscopy
(D) FT IR spectroscopy

15. Rotational spectra are observed in the
(A) Near infrared region
(B) Far infrared region
(C) Visible region
(D) Ultraviolet region

16. In the rotational spectra of diatomic molecules, the spacing between successive lines is equal to (I is moment of inertia)
(A) $\frac{h}{4\pi^2 Ic}$ (B) $2\left(\frac{h}{4\pi^2 Ic}\right)$
(C) $\frac{h}{4\pi^2 Ic^2}$ (D) $\frac{4h}{\pi^2 Ic}$

17. If v is the vibrational quantum number and v_0 is the fundamental

frequency (in cm^{-1}), the vibration energy is given by

(A) $E_\upsilon = \frac{1}{2} hc\, \nu_0$

(B) $E_\upsilon = \left(\upsilon - \frac{1}{2}\right) h\, \nu_0$

(B) $E_\upsilon = \left(\upsilon + \frac{1}{2}\right) h\, \nu_0$

(D) $E_\upsilon = \left(\upsilon + \frac{1}{2}\right) hc\nu_0$

18. The zero point energy of a molecules is (ν_0 = fundamental frequency in cm^{-1})

(A) $h\, \nu_0$ (B) $\frac{1}{2} h\, \nu_0$

(C) $\frac{1}{2} hc\, \nu_0$ (D) $\left(\upsilon + \frac{1}{2}\right) hc\, \nu_0$

19. The selection rule for transitions in rotational energy levels of a diatomic molecule is

(A) $\Delta J = +1$ (B) $\Delta J = -1$

(C) $\Delta J = \pm 1$ (D) $\Delta J = \pm 2$

20. If ν is the fundamental frequency, μ the reduced mass and k the force constant, then

(A) $k = \frac{1}{2\pi}\sqrt{\frac{\mu}{\nu}}$ (B) $\nu = \frac{1}{2\pi}\sqrt{\frac{k}{\mu}}$

(C) $\nu = 4\pi^2 k^2 \mu$ (D) $\nu = \frac{k}{\mu}\sqrt{\frac{1}{2\pi}}$

21. The difference between the incident and scattered frequencies in the Raman spectrum is called the

(A) Stoke's line

(B) Anti-Stoke's line

(C) Raman frequency

(D) P-branch

22. Which of the following relationship is correct regarding molecular energy levels?

(A) E(electronic) > E(vibrationl) > E(rotational)

(B) E(rotational) > (E(vibrational) > E(electronic)

(C) E(electronic) > E(rotational) > E(vibrational)

(D) E(vibrational) > E(electronic) > E(rotational)

23. Which of the following diamtomic molecules will not give a rotational spectrum.

(A) NO (B) HF

(C) N_2 (D) CO

24. The selection rule for the transition in rotational energy levels in the Raman spectrum is

(A) $\Delta J = \pm 1$ (B) $\Delta J = +1$

(C) $J = +2$ (D) $\Delta J = \pm 2$

25. Which of the following molecule is IR inactive?

(A) $HC \equiv CH$ (B) CO

(C) H_2O (D) N_2

26. How many normal modes of vibration are possible for CO_2 molecule?

(A) 1 (B) 2

(C) 3 (D) 4

27. How many normal modes of vibration are possible for NH_3 molecule?

(A) 2 (B) 3

(C) 4 (D) 6

28. Which of the spectrum arises when an electron jumps from one energy level to another?

(A) Rotational (B) Vibrational

(C) Nuclear (D) Electronic

ANSWERS

1. C	2. D	3. D	4. A
5. D	6. D	7. A	8. D
9. A	10. D	11. C	12. D
13. A	14. D	15. B	16. A
17. D	18. C	19. C	20. B
21. C	22. A	23. C	24. D
25. D	26. D	27. D	28. D

1.13. NUCLEAR CHEMISTRY

1. The branch of chemistry with deals with the study of changes within the nucleus is called
   (A) Radiation chemistry
   (B) Photochemistry
   (C) Nuclear chemistry
   (D) Photodynamics

2. This reaction is an example of
   $^{210}_{84}Po \rightarrow ^{206}_{82}Pb +$ _____
   (A) Alpha decay (B) Beta emission
   (C) Gamma emission
   (D) Positron emission
   (E) Electron capture

3. The missing product from this reaction
   $^{121}_{53}I \rightarrow ^{121}_{52}Te +$ _??_
   (A) $^{4}_{2}He$ (B) $^{0}_{-1}e$
   (C) $^{1}_{0}n$ (D) $^{0}_{1}e$

4. This reaction is an example of $^{41}_{20}Ca \rightarrow ^{41}_{19}K$
   (A) Alpha decay (B) Beta decay
   (C) Electron capture
   (D) Gamma emission

5. Nuclei above the belt of stability can lower their neutron-to-proton ratio by _____.
   (A) Beta emission
   (B) Gamma emission
   (C) Positron emission
   (D) Electron capture

6. Bombardment of uranium-235 with a neutron ($_0n^1$) generates tellurium-135, 3 neutrons, and __________.
   (A) Zirconium-98 (B) Krypton-101.
   (C) Krypton-103 (D) Strontium-99.

7. The reaction shown below is responsible for creating ^{14}C in the atmosphere. What is the bombarding particle? $^{14}_{7}N +$ ____ $\rightarrow ^{14}_{6}C + ^{1}_{1}H$
   (A) Alpha particle (B) Electron
   (C) Neutron (D) Positron

8. All atoms of a given element have the same
   (A) Mass number.
   (B) Number of nucleons.
   (C) Atomic mass.
   (D) Atomic number.

9. Atoms containing radioactive nuclei are called
   (A) Radionuclides (B) Nucleons.
   (C) Nuclides
   (D) Radioisophores.

10. What happens to the mass number and the atomic number of an element when it undergoes beta decay?
    (A) Neither the mass number nor the atomic number change.
    (B) The mass number decreases by 4 and the atomic number decreases by 2.
    (C) The mass number does not change and the atomic number increases by 1.
    (D) The mass number increases by 2 and the atomic number increases by 1.

11. Which one of the following processes results in an increase in the atomic number?
    (A) gamma emission
    (B) beta emission
    (C) alpha emission
    (D) corrosion

12. Of the following processes, which one changes the atomic number?
(A) Alpha emission
(B) Beta emission
(C) Electron capture
(D) All of these processes change the atomic numbers.

13. Which type of radioactive decay results in no change in mass number and atomic number for the starting nucleus?
(A) Alpha (B) Beta
(C) Electron capture (D) Gamma

14. What happens to the mass number and the atomic number of an element when it emits gamma radiation?
(A) The mass number decreases by four and the atomic number decreases by two.
(B) The mass number increases by four and the atomic number increases by two.
(C) The mass number remains unchanged while the atomic number increases by one.
(D) The mass number and atomic numbers remain unchanged.

15. Which one of the following is not a fissile material
(A) $^{235}_{92}U$ (B) $^{238}_{92}U$
(C) $^{233}_{92}U$ (D) $^{239}_{94}Pu$

16. Isotopes are atoms whose nuclei have the same atomic number but different mass numbers. A specific isotope has an atomic number of 18 and a mass number of 35. How many electrons are there in the neutral atom?
(A) 34 (B) 18
(C) 17 (D) 35

17. Two isotonic nuclcide X and Y have mass numbers 35 and 37 respectively. If the atomic number of X is 17, the atomic number of Y will be
(A) 15 (B) 17
(C) 18 (D) 19

18. The total mass of protons and neutrons of an isotope is not equal to the actual mass of nuclide. This is because of
(A) Radioactivity
(B) Binding energy
(C) Attraction between neutron and electron
(D) None of above

19. When n/p ratio of a nuclide of an element is greater than n/p ratio of a stable nuclide of the element it disintegrates emitting
(A) Alpha-particle
(B) Beta-particle (C) Neutrons
(D) Gamma-rays

20. A negative value for the packing fraction indicates that the nuclide is
(A) Stable (B) Very unstable
(C) Radioactive (D) None of above

21. The SI unit of activity is
(A) Curie (B) Becquerel
(C) Rad (D) None of above

22. One Curie(Ci) is equal to
(A) 3.7×10^{10} dps (B) 3.7×10^{10} dpm
(C) 3.7×10^{10} dph (D) None of above

23. Nuclides with same atomic number and mass number but differing in nuclear properties are called
(A) Isotopes (B) Isotones
(C) Isobars
(D) Nuclear isomers

24. Radioactivity is a nuclear process. It remains unaffected by external factor(s) such as
(A) Temperature (B) Pressure
(C) Catalyst (D) All above

25. The nuclear decay follows which order kinetics
(A) Zero order (B) 3rd order
(C) 2nd order (D) 1st order

26. Which of the following radiation is emitted during nuclear decay?
(A) Alpha rays (B) Beta rays
(C) Gamma rays (D) All of above

27. Which of the following particle is not accelerated in particle accelerators?
(A) Proton (B) Electron
(C) Neutron (D) All of above

28. Which of the following device(s) is used as particle accelerator?
(A) Cyclotron (B) Synchroton
(C) Linear accelerator
(D) All of above

29. The process of splitting of a heavier nucleus into smaller fragments by bombarding with suitable subatomic particle is called
(A) Nuclear fusion (B) Nuclear fission
(C) Spallation reaction
(D) Beta decay

30. The process of splitting of a heavier nucleus into several fragments by bombarding with suitable high speed projectile is called
(A) Nuclear fusion (B) Nuclear fission
(C) Spallation reaction
(D) Beta decay

31. Atomic bomb is based on which nuclear process
(A) Nuclear fusion (B) Nuclear fission
(C) Spallation reaction
(D) Beta decay

32. Which of the following nuclide(s) is used as nuclear fuel?
(A) U-235 (B) U-233
(C) Pu-239 (D) All above

33. Controlled nuclear fission process is carried out in
(A) Nuclear reactor
(B) Atomic bomb
(C) Hydrogen bomb
(D) Neutron bomb

34. Which of the following substance is used as moderator to slow down the speed of neutron in reactor?
(A) Soft water (B) Heavy water
(C) Diamond (D) Aluminium

35. Which of the following substance is used as control rods in nuclear reactor?
(A) B (B) Al
(C) Graphite (D) Ca

36. The process in which lighter nuclides fuse together to form a heavy nuclide and more stable nuclides is called
(A) Nuclear fusion (B) Nuclear fission
(C) Spallation reaction
(D) Beta decay

37. Which of the following technique is used to find the age of the old wooden objects or animal fossils?
(A) C-12 dating (B) C-13 dating
(C) C- 14 dating (D) Beta decay

38. Which of the following are industrial applications of tracers?
(A) Measurement of bulk flow
(B) Mixing efficiency
(C) Leak measurement
(D) All above

39. Which of the following are medical applications of radioisotopes?
(A) Relief of Leukemia
(B) Relief of cancer
(C) Treatment of goiter (D) All above

40. Naturally occurring uranium contains only which % of U-235?
(A) 0.1 % (B) 0.3 %
(C) 0.5% (D) 0.7%

41. A stable nuclide has in general
(A) Even no of protons and even no of neutrons
(B) Odd no of protons and odd no of neutrons
(C) Odd no of protons and even no of neutrons
(D) Equal no of protons and neutrons

42. The instability of a nuclide is due to
(A) High electron proton ratio
(B) High neutron proton ratio
(C) Low electron proton ratio
(D) Low neutron electron ratio

43. Which of the following particles is considered to be responsible for keeping nucleons together?
(A) Protons (B) Neutrons
(C) Positrons (D) Mesons

44. Isotopes contain same number of
(A) Neutrons (B) Protons
(C) Positrons (D) Electrons

45. In balancing the nuclear reaction $^{238}{}_{92}U \rightarrow {}^{234}{}_{x}E + {}^{4}{}_{2}He$, the value of x is ________.
(A) 92 (B) 94
(C) 90 (D) 234/2

ANSWERS

1. C	2. A	3. D	4. C
5. A	6. A	7. C	8. D
9. A	10. C	11. B	12. D
13. D	14. D	15. B	16. B
17. D	18. B	19. B	20. A
21. B	22. A	23. D	24. D
25. D	26. D	27. C	28. D
29. B	30. C	31. B	32. D
33. A	34. B	35. A	36. A
37. C	38. D	39. D	40. D
41. A	42. B	43. D	44. B
45. C			

2.1. STRUCTURAL CONCEPTS AND BONDING IN ORGANIC MOLECULES

1. Shape of electron cloud in an atom is related to
(A) Spin quantum number
(B) Magnetic quantum number
(C) Azimuthal quantum number
(D) Principal quantum number

2. Molecular orbital theory was developed by which of the following scientist?
(A) E. Schrodinger
(B) Pauling
(C) Heitler, London and Pauling
(D) Mulliken, Hund and Huckel

3. Which of the following bonds has least bond energy?
(A) Ionic bond (B) Covalent bond
(C) Coordinate bond
(D) H-bond

4. The hybridization of C-atoms in 1, 2 butadiene is
(A) sp (B) sp^2
(C) sp^3 (D) sp^2, sp^3, sp

5. Which of the following hybridization results in a linear organic molecules?
(A) sp (B) sp^2
(C) sp^3 (D) sp^3d

6. Which of the following molecules has shortest C — C bond length?
(A) $CH_3-CH_2-CH_3$
(B) $CH_3C\equiv CH$
(C) $CH_3CH=CH_2$
(D) $CH_2=CH-CH_2-CH_3$

7. Which of the following order of bond angles is not correct?
(A) $H_2O < NH_3 < CH_4$
(B) $H_2S < H_2O < NH_3$
(C) $PH_3 < NH_3 < CH_4$
(D) $H_2O < CH_4 < H_2S$

8. Which of the following is the correct order of bond dipole moment?
(A) $C-Cl > C-Br > C-I$
(B) $C-Cl < C-I < -Br$
(C) $C-Br < C-I < C-Cl$
(D) $C-I > C-Br > C-Cl$

9. Which of the following. molecule has more dipole moment?
(A) Methane (B) Nitrophenol
(C) Chloroform (D) Toluene

10. An induction of dipole or polarity in non-polar bond, and consequent electron shifting along a chain of atoms is known as
(A) Inductive effect
(B) Resonance effect
(C) Hyper conjugation
(D) Stark effect

11. Which of the following statements is not correct with respect to inductive effect?
(A) Bond length decreases with increase in inductive effect
(B) Inductive effect generates polar character in bonds
(C) Variation in strength of aliphatic acids can be explained
(D) The difference in strength of various amines can be explained

12. Inductive effect can be used to explain
(A) Dipole moment of chemical bonds
(B) Strength of acids
(C) Strength of bases
(D) All above

13. Correct order of increasing — I effect of groups is
(A) $—NO_2$ > — CN > — COOH > — F
(B) — CN > $—NO_2$ > — COOH > — F
(C) — F > — COOH > — CN > $—NO_2$
(D) — F > — CN > $—NO_2$ > COOH
(E) —CN > — COOH > $—NO_2$ > — F

14. Which of the following case of acid or base strength is not explained by inductive effect?
(A) Formic acid > acetic acid
(B) Dimethyl amine > trimethyl amine
(C) Dimethyl amine > methyl amine
(D) Chloroacetic acid > acetic acid

15. The complete transfer of a shared pair of electrons to one of the atoms joined by a double or triple bond at the requirement of an attacking reagent is known as
(A) Inductive effect
(B) Resonance effect
(C) Hyperconjugation
(D) Electromeric effect

16. Which of the following statements is not correct with respect to electrometric effect?
(A) It is permanent effect
(B) It is brought into play instantaneously at the demand of attacking reagent
(C) It proceeds a polar addition reaction
(D) The original electronic condition is restored after the removal of attacking reagent

17. The decrease in electron density at one position accompanied by a corresponding increase at other position is called
(A) Inductive effect
(B) Asymmetric effect
(C) Electromeric effect
(D) Resonance effect

18. Which of the following statements is not correct with respect to resonance?
(A) The position of atomic nuclei must be same
(B) The limiting structures must have same number of paired and unpaired electrons
(C) The energy of the various limiting structures must be same
(D) All limiting structures must contribute equally

19. Which of the following statements is not correct with respect to the important characteristics of aromatic compounds?
(A) They are usually cyclic compounds
(B) They are resistant to usual addition reactions
(C) They usually undergo substitution reactions
(D) They are less stable

20. Which of the following class of compounds follow the criteria of aromaticity?
(A) The compounds must have high degree of unsaturation
(B) They must have the property to undergo addition reactions
(C) They must have the property to undergo substitution reactions
(D) They must have cyclic clouds of delocalized $(4n + 2)\pi$ electrons

21. How many π electrons are present in benzene, naphthalene and anthracene?
(A) 10, 6, 14 (B) 2, 6, 14
(C) 6, 10, 14 (D) 2, 4, 6

22. Which of the following organic molecule is not aromatic?
(A) Benzene (B) Naphthalene
(C) Anthracene
(D) Cyclo-octatetraene

23. In hydrogen bonding a hydrogen atom is bonded to which of the highly electronegative atoms?
(A) N (B) O
(C) F (D) N, O, F

24. Which of the following statements is not correct with respect to applications of H-bonding?
(A) It explains the usual b.p. and m.p. of certain class of compounds
(B) It explains the solubility of certain organic compounds in hydroxylic solvents
(C) It explains the lack of ideal behavior in gases and solutions
(D) It has strong influence on the configuration of certain molecules

25. The compounds whose formation require a host compound and a guest compound are called
(A) Exclusion compounds
(B) Inclusion compounds
(C) Crystal compounds
(D) Stoichiometric compounds

26. The common host compound for the formation of inclusion compound is
(A) Urea (B) Thiourea
(C) Cholic acid (D) All above

27. Cyclic polymers of ethylene glycol formed by condensation are called
(A) Crown ether (B) Brown ether
(C) Cryptates (D) Both A and C

28. Compounds consisting of two or more interlocked rings are called
(A) Inclusion compounds
(B) Cage compounds
(C) Catenanes
(D) Crown ether

29. The delocalization involving C — H sigma bond electrons is known as
(A) Conjugation
(B) Hyperconjugation
(C) Resonance (D) Mesomerism

30. The criteria for aromaticity is presence of
(A) Unsaturations
(B) Cyclic structure
(C) Presence of $4n\pi$ electrons
(D) Presence of $4n + 2\pi$ electrons

31. C — O bond lengths in carboxylate anion are equal due to
(A) Resonance effect
(B) Inductive effect
(C) H-bonding
(D) Resonance of identical contributing structures

32. Chlorine when attached to benzene has
(A) +I and +R effect
(B) –I and –R effect
(C) –1 and +R effect
(D) +1 and –R effect

33. Which of the following group will have hyperconjugation effect when attached to benzene?
(A) $— CH_3$ (B) $— C_6H_5$
(C) $— C(CH_3)_3$ (D) $— CH(CH_3)_2$

34. Which of the following is most basic?
(A) Aniline (B) Benzylamine
(C) Diphenylamine
(D) N-methylaniline

35. Which of the following is most acidic?
(A) Phenol (B) p-nitrophenol
(C) o-Nitrophenol (D) m-nitrophenol

36. Which of the following effects best explains that o-nitrophenol is insoluble in water?
(A) Inductive effect
(B) Resonance effect
(C) Intermolecular H-bonding
(D) Intramolecular H-bonding

37. Trimethylamine is a weaker base than dimethylamine is explained by
(A) Steric effect
(B) Resonance effect
(C) Inductive effect
(D) Electromeric effect

38. All bond lengths in benzene are identical due to
(A) Resonance effect
(B) Inductomeric effect
(C) Electromeric effect
(D) Hyperconjugation

39. The greater stability of benzyl carbonium ion as compared to t-butyl carbonium ion is due to
(A) Inductive effect
(B) Resonance effect
(C) Electrometric effect
(D) Steric effect

40. Compounds in which carbons use only sp^3 hybrid orbital for bond formation is
(A) $HC\equiv CH$
(B) $CH_3CH_2CH_3$
(C) $CH_3-CH=CH_2$
(D) $CH\equiv CH-CH_2-CH_3$

41. Which of the following is a planar molecule?
(A) Acetone
(B) Formic acid
(C) Acetic acid
(D) All above

42. The bond angle between hybrid orbitals in methane is
(A) 115.5°
(B) 109.5°
(C) 105.7°
(D) 180°

43. The bond length of C=C is
(A) 1.20A°
(B) 1.34A°
(C) 1.54A°
(D) 1.68A°

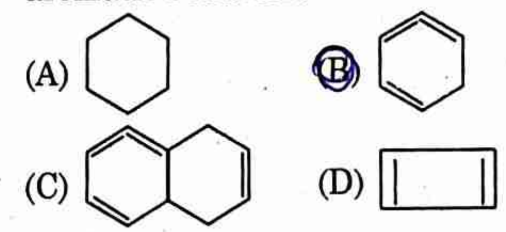
44. Which of the following hydrocarbons has the shortest C — C bond length?
(A) CH_3CH_3
(B) $CH_2=CH_2$
(C) $HC\equiv CH$
(D) Benzene

45. The carbon-carbon bond strength is maximum in
(A) CH_3CH_3
(B) $CH_2=CH_2$
(C) $HC\equiv CH$
(D) Benzene

46. Which of the following is the correct order of bond length?
(A) $C-C < C=C < C\equiv C$
(B) $C-C > C\equiv C > C=C$
(C) $C\equiv C > C-C > C=C$
(D) $C\equiv C < C-C > C=C$

47. Which statement is true?
(A) Resonance hybrids are inherently unstable
(B) Resonance hybrids are more stable than any individual resonance form
(C) Resonance hybrids are average of all resonance forms resembling the less stable forms
(D) Resonance hybrids are averages of all resonance forms resembling the more stable forms

48. Which of the following will show aromatic behavior?



49. Which of the following statement is false about resonance?
(A) It increases the stability of a molecule
(B) It leads to similar type of bonds
(C) It increases the reactivity of the molecule
(D) It decreases the reactivity of the molecule

50. In which of the following molecules, the +R effect is present?
(A) [benzene ring]
(B) [benzene ring with CHO]
(C) [benzene ring]—COOH
(D) [benzene ring]—OH

51. The most stable carbonium ion is
(A) See butyl (B) n-butyl
(C) Tert butyl (D) Isobutyl

52. Each of the following group exerts a +I effect except
(A) $(CH_3)_3 C^-$ (B) $^-CH_3$
(C) OH^- (D) CH_3^+

53. Which of the following compounds has highest dipole moment?
(A) Dichloromethane
(B) Chloroform
(C) Chloromethane
(D) Carbon tetrachloride

ANSWERS

1. C	2. D	3. D	4. D
5. A	6. B	7. D	8. A
9. B	10. A	11. D	12. D
13. A	14. B	15. D	16. A
17. D	18. D	19. D	20. B
21. C	22. D	23. D	24. A
25. B	26. D	27. D	28. C
29. D	30. D	31. D	32. C
33. A	34. D	35. B	36. D
37. A	38. A	39. B	40. B
41. D	42. B	43. D	44. C
45. A	46. A	47. D	48. B
49. C	50. D	51. C	52. D
53. A			

2.2. PURIFICATION AND CHARACTERIZATION OF ORGANIC COMPOUNDS

1. Which of the following steps is involved in structure determination of an organic compound?
   (A) Purification of compound
   (B) Qualitative and quantitative analysis of elements present
   (C) Determination of molar mass
   (D) All above steps

2. Which of the following techniques is involved in purification of organic compounds?
   (A) Distillation (B) Sublimation
   (C) Solvent extraction
   (D) All above

3. Recrystallization is the most common technique of purification of solid organic substances. Which of the following statements is not related with characteristics of a suitable solvent
   (A) It dissolves the substance on heating
   (B) It readily allows it to separate out in the form of crystal on cooling
   (C) It does not dissolve the impurities at all
   (D) It does dissolve the impurities

4. Sugar and common salt in a mixture can be separated through the process of
   (A) Sublimation B) Distillation
   (C) Chromatography
   (D) Crystallization from solution in ethanol

5. An impure sample of camphor, contaminated with sand, can be purified by
   (A) Distillation (B) Sublimation
   (C) Steam distillation
   (D) Chromatography

6. The violet colour in the Lassaigne's test of sulphur is due to
   (A) $FeCl_3$
   (B) $Na_4[Fe(CN)_5NOS]$
   (C) $Na_3[Fe(CNS)_6]$
   (D) $Fe_4[Fe(CN)_6]_3$

7. Identify the incorrect statement regarding crystallization from the following
   (A) It is an important procedure for purifying solids
   (B) The impurities are removed by filtering the solution
   (C) Crystals are separated by filtration
   (D) In crystallization method, the solid is dissolved in a solvent in which it is soluble at all temperature

8. The function of boiling the sodium extract with conc.HNO_3 before testing the halogens is
   (A) To make solution clear
   (B) To make the solution acidic
   (C) To bring common ion effect
   (D) To destroy CN^- and S^{2-} ion

9. Two solids A and B have appreciable different solubilities in water but their m.p. are very close. The mixture A and B can be separated by
   (A) Sublimation (B) Distillation
   (C) Fractional crystallization
   (D) Specific rotation

10. The stationary and mobile phases in paper chromatography are
(A) Liquid/liquid (B) Solid/liquid
(C) Liquid/solid (D) Liquid/gas

11. In Dumas method, the volume of the gas collected is equivalent to which of the following gases set free from the compound.
(A) Ammonia (B) CO_2
(C) N_2 (D) NO

12. Carbon and hydrogen are estimated by
(A) Liebig's method
(B) Dumas method
(C) Kjeldhal's method
(D) Carries method

13. Phosphorus is detected by fusing the organic compound with — followed by extraction with H_2O
(A) HNO_3 (B) H_2SO_4
(C) Sodium peroxide
(D) Ozone

14. The molar mass of an organic acids is determined by
(A) Depression of freezing point
(B) Elevation of boiling point
(C) Volumetric method
(D) Victor Meyer's method

15. The simplest formula of a compound containing 50% of element X (at. wt = 10) and 50% Y (at. wt = 20) is
(A) XY_2 (B) XY
(C) X_2Y (D) X_2Y_3

16. Beillstein test is used for
(A) Cl (B) N_2
(C) CO_2 (D) Na

17. The most suitable method of separation in mixture of o- and p-nitrophenol is
(A) Steam distillation
(B) Chromatography
(C) Sublimation (D) Ion-exchange

18. Essential oils are purified by which of the following methods?
(A) Steam distillation
(B) Sublimation
(C) Crystallization
(D) Fractional crystallization

19. Presence of nitrogen in organic compound is tested as?
(A) Nitrogen gas (B) NH_3
(C) NO (D) CN^-

20. When $FeSO_4$ is added in the sodium extract the compound formed is
(A) Only $Na_4[Fe(CN)_6]$
(B) Only $Fe(OH)_2$
(C) Only Na_2SO_4
(D) Mixture of all these

21. A student was given the compound $H_2N-C_6H_4-SO_3H$ for elemental analysis. While performing Lassaigue's test for N, what colour will be get and why?
(A) Pale green, due to the formation of NaCN
(B) Colorless, due to the formation of $Na_4[Fe(CN)_6]$
(C) Blood red, due to the presence of S
(D) Blood red, due to the presence of both S and N

22. Which of the following compound will not give the Lassazigne's test of nitrogen?
(A) $H_2NCONHNH_2 \cdot HCl$
(B) $H_2N-NH_2 \cdot 2HCl$
(C) H_2NCONH_2
(D) $C_6H_5-N=N-C_6H_5$

23. In Organic analysis Lassaigne test is employed for
(A) Nitrogenous functional groups
(B) Halogens and sulphur based functional groups
(C) Elemental analysis (D) Both A&B

24. In Lassaigne test nitrogen is identified by detecting
(A) Cyanide (B) Amine
(C) Nitride (D) None of these

25. In Lassaigne test, sulphur is identified by detecting
(A) Sulphate ion (B) Thiols
(C) Sulphide (D) None of these

26. Chloroform layer test is employed for detection of
(A) Halogens (B) Carbonyls
(C) Amines (D) None of these

27. Bromine test is employed to detect
(A) Unsaturation (B) Carbohydrates
(C) Carbonyls (D) None of these

28. Aromatic alcohols can be identified by
(A) Natural ferric chloride test
(B) Baeyer test
(C) Dinitrophenyl Hydrazine test
(D) None of these

29. Which one is not a test for detection of carbonyls?
(A) Dinitrophenylhydrazine
(B) Tollen test (C) Schiff test
(D) Molisch test

30. Which one is not a test for detection of amine?
(A) Locas test
(B) Hydrooxamic acid test
(C) Diazotization test
(D) Tollen test

31. Phenolphthalein is an indicator for
(A) Mild to strong alkaline condition
(B) Acidic conditions
(C) Neutral conditions
(D) Both A & B

32. Which one is not a test for detection of carbohydrats?
(A) Molisch test (B) Conc. H_2SO_4
(C) Benedict test (D) Formalin test

33. Aromatic hydrocarbons can be characterized by
(A) Friedel Crafts test
(B) Formalin test (C) Both A&B
(D) None of these

34. Halogenated aromatic hydrocarbons can be identified by
(A) Alcoholic $AgNO_3$
(B) Fehling solution
(C) Both A & B (D) None of these

ANSWERS

1. D	2. D	3. D	4. D
5. B	6. B	7. D	8. D
9. C	10. B	11. C	12. A
13. C	14. C	15. C	16. A
17. A	18. A	19. D	20. D
21. D	22. D	23. C	24. A
25. C	26. A	27. A	28. A
29. D	30. D	31. A	32. D
33. B	34. A		

2.3. NOMENCLATURE OF ORGANIC COMPOUNDS

1. The IUPAC suffix used for — NC group is
(A) Cyanide (B) Isocyanides
(C) Carbylamines (D) Nitrile

2. The IUPAC name of ethylene oxide is
(A) Epoxy methane (B) Oxoethene
(C) Methoxymethane
(D) Oxirane

3. The compound $(CH_3)_3COH$ according to IUPAC is known as
(A) Tert-Butanol
(B) 2,2-Dimethyl-propanol
(C) 2-Methyl-2-propanol
(D) 1,1-Diethylethanol

4. The IUPAC name of $C_2H_5{\cdot}COOCOC_2H_5$ is
(A) Propanoic anhydride
(B) Ethanoic anhydride
(C) Diketoethoxy ether
(D) Ethexyethanone

5. The compound
$Br - CH_2 - CHBr - CH = CH_2$ is named as
(A) 1,2-dibromo-3-butene
(B) 3,4-dibromo-1-butene
(C) 3,4-dibromo-2-butene
(D) 1,2-dibromo-4-butene

6. The IUPAC name of $HCONH_2$ is
(A) Methanamide
(B) Methanoylamine
(C) Aminoethanal (D) Formanide

7. The IUPAC name of $C_2(CN)_4$ is
(A) 2,3-dicyano butanedinitrile
(B) 2,3-dicyano-2-butenedinitrile
(C) 1,1, 2,2-tetrcyanoethane
(D) 1,1,2,2-tetracyanoethene

8. The IUPAC name of (cyclohexane ring bearing COOH) is
(A) Cyclohexane carboxylic acid
(B) Cyclohexanoic acid
(C) Carboxybenzene
(D) Carboxyl cyclohexane

9. The IUPAC name of $HOCCH_2CH_2CH_2COOH$ is
(A) 4-formylbutanoic acid
(B) 5-formylpentanoic acid
(C) 4-carboxybutanal
(D) 5-carboxypentanal

10. The IUPAC name of $(CH_3)_2CHN(CH_3)_2$ is
(A) Dimethylamino propane
(B) N,N-dimethyl-1-aminopropane
(C) N,N-dimethyl-2-aminopropane
(D) N,N-dimethylpropylamine

11. The IUPAC name of (skeletal structure) is
(A) 3,7-nonadiene
(B) 7-ethyl-3-methylene-1-ene
(C) 2,6-diethyl-1,6-hepatadiene
(D) 2,6,Diethyl-1, 6-heptene

12. The IUPAC name of

COOH
HOOC COOH is

(A) 1,2,5, tricarboxylic acid
(B) 1,3,5,tricarboxylic acid
(C) Tricarboxylic acid
(D) 2,4,6 tricarboxylic acid

13. The IUPAC name of (fused two-ring structure) is
(A) Dicyclobutane
(B) Bicyclo [2.2.0] hexane

(C) Bicyclo [2.2.1] hexane
(D) None of the above

14. The IUPAC name of [structure] is

(A) Bicyclo [5.5.0] nonane
(B) Biphenyl
(C) Cyclopropyl cyclohexane
(D) Spiro [2.5] octane

15. The IUPAC name is [structure]
(A) Bicyclo [2.2.0] hexane
(B) Spiro [2.2] hexane
(C) Spiro [2.2] pentane
(D) None of the above

16. The IUPAC name of [structure]

(A) Bicylco [3.2.1] octane
(B) Bicyclo [3.2.2] octane
(C) Spiro [2.2] octane
(D) None of these

17. The structures of Spiro [3.3] heptanes is

(A) [structure] (B) [structure]
(C) [structure] (D) [structure]

18. The IUPAC name of [structure: o, o] is

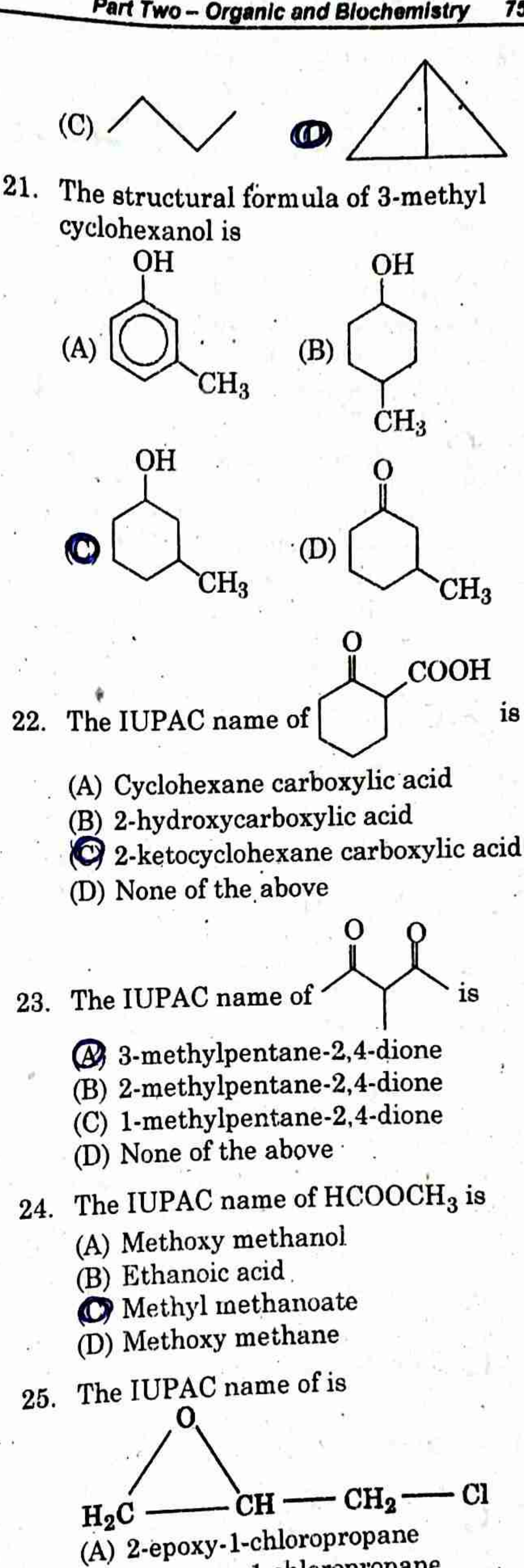
(A) 1,4-dioxane (B) Oxirane
(C) Oxirene (D) 1,2-Dioxane

19. The IUPAC name of [structure: COOH, N] is

(A) Pyridine-3-carboxylic acid
(B) Carboxyl pyridine
(C) Pyridine-1-carboxylic acid
(D) None of these

20. The structure of bicyclo [1.1.0] butane is

(A) [structure] (B) [structure]



(C) [structure] (D) [structure]

21. The structural formula of 3-methyl cyclohexanol is

(A) [structure: OH, CH_3] (B) [structure: OH, CH_3]

(C) [structure: OH, CH_3] (D) [structure: O, CH_3]

22. The IUPAC name of [structure: O, COOH] is

(A) Cyclohexane carboxylic acid
(B) 2-hydroxycarboxylic acid
(C) 2-ketocyclohexane carboxylic acid
(D) None of the above

23. The IUPAC name of [structure: O, O] is

(A) 3-methylpentane-2,4-dione
(B) 2-methylpentane-2,4-dione
(C) 1-methylpentane-2,4-dione
(D) None of the above

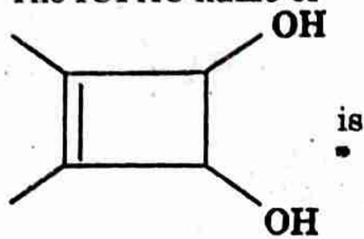
24. The IUPAC name of $HCOOCH_3$ is
(A) Methoxy methanol
(B) Ethanoic acid
(C) Methyl methanoate
(D) Methoxy methane

25. The IUPAC name of is

[structure: O, H_2C — CH — CH_2 — Cl]

(A) 2-epoxy-1-chloropropane
(B) 2,3-epoxy-1-chloropropane
(C) epoxy-1-chloropropane
(D) 3-chloro-1,2-epoxy propane

26. The IUPAC name of

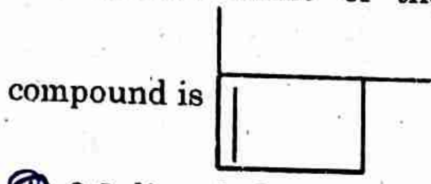


is

(A) 1,2-dimethyl cyclo 3,4-butane-diol
(B) 1,2-dihydroxy 3,4-dimethyl cyclobut-3-ene
(C) 2,3-dimethyl cyclo but-2-ene-1, 4-diol
(D) 3,4-dimethyl cyclo but-3-ene-1,2-diol

27. The IUPAC name of
$NH_2 — CH — CH_2OH$ is
(with COOH on the CH)
(A) 1-amino-2-hydroxy propanoic acid
(B) 2-amino-2-carboxy pentanol
(C) 2-Amine-3-hydroxy propanoic acid
(D) None of the above

28. The IUPAC name of the following compound is

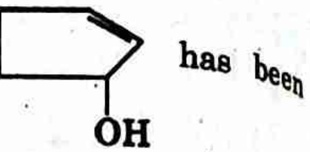


(A) 2,3-dimethyl cyclobutene-1
(B) 1,2-dimethyl cyclobutene-1
(C) 1,4-dimethyl cyclbutene-1
(D) 1,2-dimethyl cyclobutene-2

29. The IUPAC name of the compound
$CH \equiv C—CH_2—CH_2—CH_2—COOH$
is
(A) 1-pentyn-4-oic acid
(B) Pentyn-1-oic acid
(C) 5-pentyn-1-oic acid
(D) Pent-4-yn-1-oic acid

30. IUPAC name of [structure] is
(A) Bicyclo [4.2.0] octane
(B) Bicyclo [4.2.2] octane
(C) Bicyclo [6.2.0] octane
(D) Bicyclo [4.2.2] decane

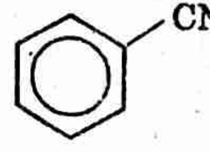
31. The compound



has been named in IUPAC as
(A) 2-hydroxycyclopentane
(B) Cyclopent-2-ene-1-ole
(C) Bicyclo [4.2.2] decane
(D) Cydopent-1-oil

32. The IUPAC name of [structure: Cl, CH_3, CH_3] is
(A) 4-chlorometaxylene
(B) 2-chloro-1,4-dimetyl benzene
(C) 1-chloro-2, 4-dimethyl benzene
(D) 4-chloro-3-methyl toluene

33. The IUPAC name of the compound is



(A) Benzene carbonitrile
(B) Phenyl nitrile
(C) Phenyl carbocyanide
(D) Benzene nitrile

ANSWERS

1. D	2. B	3. B	4. A
5. C	6. A	7. D	8. A
9. A	10. C	11. A	12. B
13. B	14. D	15. C	16. A
17. B	18. A	19. A	20. D
21. C	22. C	23. A	24. C
25. D	26. D	27. C	28. A
29. D	30. A	31. B	32. C
33. D			

2.4. STEREOCHEMISTRY

1. Compounds HCN and HNC are
(A) Tautomers (B) Metamers
(C) Functional isomers
(D) Conformers

2. Alkyl cyanide and alkyl isocyanides are
(A) Tautomers (B) Metamers
(C) Functional isomers
(D) Geometric isomers

3. Various compounds corresponding to molecular formula C_4H_{10} are
(A) Functional isomers
(B) Position isomers
(C) Tautomers (D) Chain isomers

4. Which of the following molecules can exhibit geometrical isomerism?
(A) $CH_3CH=CH_2$
(B) $CH_3CH=CHCH_3$
(C) $(CH_3)_2C=CH_2$
(D) $CH_3CH=C(CH_3)_2$

5. Geometrical isomerism can be exhibited by compounds containing
(A) $>C=C<$ (B) $>C=N-$
(C) $-N=N-$ (D) All of these

6. Which of the following is capable of showing optical isomerism?
(A) $CH_3COCOOH$
(B) $CH_3CHOHCOOH$
(C) $CH_3-CH(CH_3)COOH$
(D) $HOOCCH(CH_3)COOH$

7. Different arrangements of groups in space which can be converted into one another by rotation around a single bond are called
(A) Metamers (B) Conformations
(C) Enantiomers (D) Configuration

8. Stereoisomers not related to each other as object and minor image are called
(A) Enantiomers (B) Antipodes
(C) Diastereoisomers
(D) Conformations

9. How many optical isomers are possible for $CH(OH)COOH-CH(Br)COOH$
(A) 2 (B) 3
(C) 4 (D) 8

10. The compound $(CH_3)(H)C=C(H)(COOH)$ has the configuration
(A) E-configuration
(B) Z-configuration
(C) R-configuration
(D) S-configuration

11. Which of the following property has a higher value for trans-isomer as compared to cis-isomer?
(A) Density
(B) Dipole moment
(C) Melting point (D) Boiling point

12. Which configuration has lowest potential energy?
(A) Eclipsed (B) Staggered
(C) Skew
(D) All have same energy

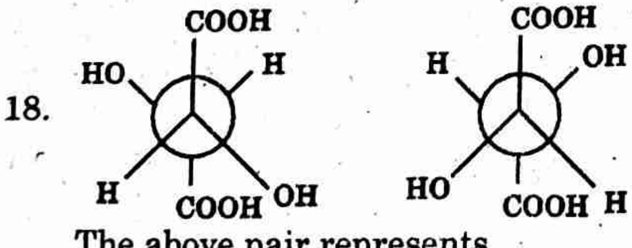
13. D(+)glyceraldehydes has the absolute configuration
(A) E — (B) S —
(C) R — (D) Z —

14. *Cis*-2-Butene on reaction with bromine gives 2,3-dibromobutane which is
(A) Racemic mixture
(B) Meso-isomer (C) Dextoroisomer
(D) Levoisomer

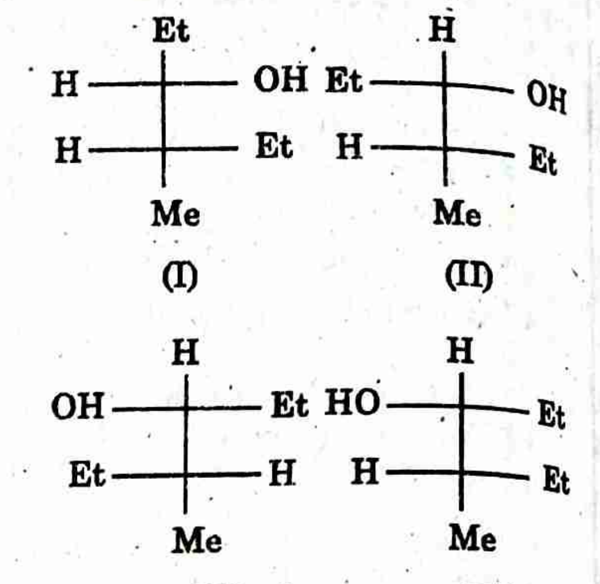
15. According to R, S system the correct order of priority of the following groups is
(A) — CH_2OH > — CHO > — COOH
(B) — COOH > — CHO > — CH_2OH
(C) — CH_2OH > — COOH > — CHO
(D) — COOH > — CH_2OH > — CHO

16. The angel of rotation of plane polarized light in polarimeter depends on
(A) Concentration of substance
(B) Length of polarimeter tube
(C) Nature of the substance
(D) All above

17. Process of separating the racemic mixture into optically active isomers is known as
(A) Resolution (B) Racemisation
(C) Walden inversion
(D) Epimerization

18. 

The above pair represents
(A) Enantiomers
(B) Diashtereoisomers
(C) Identical compounds
(D) Position isomers

19. Among the following, the pair of enantiomers is


(A) I and II (B) II and IV
(C) II and III (D) III and I

20. Which of the following compounds tautomerism?
(A) Ethoxyethane (B) Ethanol
(C) Nitroethane (D) Chloroethane

21. Lactic acid is a molecule which shows
(A) Epimersim (B) Tautomerism
(C) Optical isomerism
(D) Metamerism

22. 2-Butanol is optically active because it contains
(A) an asymmetric carbon atom
(B) A plane of symmetry
(C) Centre of symmetry
(D) A hydroxyl group
(E) Improper rotation

23. Which of the following compound will be optically active?
(A) Succinic acid
(B) Meso-tartaric acid
(C) Acetic acid (D) Lactic acid

24. What is the possible number of optical isomers for a compound contained 2 dissimilar asymmetric carbon atoms?
(A) 2 (B) 4
(C) 6 (D) 8

25. Which of the following statements is false about enantiomers?
(A) Rotate plane of polarized light
(B) Are superimposable mirror images
(C) Nonsuperimposable mirror images
(D) Have the same melting points

26. Enantiomers have which of the following characteristics?
(A) Rotate ordinary light
(B) Have the same melting point
(C) Are superimposable mirror images
(D) React with optically active molecules at the same rate

27. It is possible to distinguish between optical isomers
(A) Using chemical tests
(B) By mass spectrometry
(C) By IR spectroscopy
(D) By polarimetry

28. Plane polarized light is affected by
(A) Identical molecules
(B) All polymers
(C) Chiral molecules
(D) All biomolecules

29. A molecule is said to be chiral
(A) If it contains plane of symmetry
(B) If it contains centre of symmetry
(C) If it cannot be superimposed on its mirror image
(D) If it can be superimposed on its mirror image

30. An optically active compound
(A) Must contain at least faour carbons
(B) When in solution rotate the plane of polarized light
(C) Must always contain an asymmetric carbon atom
(D) In solution always gives negative reading in polarimetre

31. Maleic acid and fumaric acid are
(A) Diastereoisomers
(B) Enantiomers
(C) Homologous
(D) Geometrical iosmers

32. Which of the following are structural isomers?
(A) Functional isomers
(B) Chain isomers
(C) Position isomers (D) All above

33. n-Butane and 2-methylpropane are examples of
(A) Functional isomers
(B) Chain isomers
(C) Position isomers (D) Tautomers

34. 1-Propanaol and 2-propanol are examples of
(A) Functional isomers
(B) Chain isomers
(C) Position isomers (D) Tautomers

35. Acetone and diethyl ether are examples of
(A) Functional isomers
(B) Chain isomers
(C) Position isomers (D) Tautomers

36. Two structural isomers which differ in the relative positions of their atoms and are readily interconvertible are called
(A) Functional isomers
(B) Chain isomers
(C) Position isomers (D) Tautomers

37. Isomers that have the same structural formula but differ in the arrangement of atoms in the three dimensional space are called
(A) Functional isomers
(B) Chain isomers
(C) Stereoisomers
(D) Tautomers

38. Stereoisomers that can be interconverted by rotation about a single bond are called
(A) Functional isomers
(B) Chain isomers
(C) Conformers (D) Tautomers

39. The device which is used to measure the optical activity is called
(A) Potentiometer
(B) Conductivity meter
(C) Polariscope (D) Photometer

40. Which of the following compounds show optical activity?
(A) Maleic acid (B) Aldehyde
(C) Sucrose (D) Oxalic acid

41. Stereoisomers that are related like an object and its mirror image but are nonsuperimposable are called
(A) Functional isomers
(B) Chain isomers
(C) Enantiomers (D) Tautomers

42. The configuration of a compound with reference to the arbitarily assigned configuration is called
(A) Absolute configuration
(B) Retention of configuration
(C) Relative configuration
(D) None of above

43. An equimolar mixture of a pair of enantiomers is called
(A) Ideal mixture (B) Real mixture
(C) Racemate mixture
(D) All above

44. Which of the following is an element of symmetry?
(A) Proper rotation
(B) Plane of symmetry
(C) Centre of inversion
(D) All above

45. Which of the following methods is used for resolution of racemic mixture?
(A) Physical method
(B) Chemical method
(C) Biological method
(D) All above

46. Which of the following methods is used for the determination of configuration of geometrical isomers?
(A) Solubility (B) Melting point
(C) Dipole moment (D) All above

47. Anthracene is isomeric with
(A) Physical method
(B) Naphthalene
(C) Benzene (D) Phenanthrene

48. The functional isomers of ether are
(A) Hydrocarbons (B) Ketones
(C) Aldehydes (D) Alcohols

49. The least stable conformation of cyclohexane is
(A) Chair (B) Boat
(C) Twist boat (D) Half chair

50. The energy difference between staggered and eclipsed conformation of ethane is
(A) 25 kJ/mol (B) 30 kJ/mol
(C) 100 kJ/mol (D) 12.5 kJ/mol

51. The total number of conformation of ethane are
(A) 3 (B) 5
(C) 7 (D) Infinite

52. The energy difference between boat and chair conformation of cyclohexane is
(A) 50 kJ/mol (B) 12.5 kJ/mol
(C) 100 kJ/mol (D) 30 kJ/mol

53. Various compounds corresponding to molecular formula C_4H_{10} are
(A) Functional isomers
(B) Position isomers
(C) Tautomers (D) Chain isomers

54. Which of the following molecules can exhibit geometrical isomerism?
(A) $CH_3CH{=}CH_2$
(B) $CH_3CH{=}CHCH_3$
(C) $(CH_3)_2C{=}CH_2$
(D) $CH_3CH{=}C(CH_3)_2$

55. Which of the following is capable of showing optical isomerism?
(A) $CH_3COCOOH$
(B) $CH_3CHOHCOOH$
(C) $CH_3-\underset{}{\overset{CH_3}{\overset{|}{C}}}HCOOH$
(D) $HOO\overset{CH_3}{\overset{|}{C}}HCOOH$

56. Different arrangements of groups in space which can be converted into one another by rotation around a single bond are called
(A) Metamers (B) Conformations
(C) Enantiomers (D) Configuration

57. Stereoisomers not related to each other as object and minor image are called
(A) Enantiomers (B) Antipodes
(C) Diastereoisomers
(D) Conformations

58. How many optical isomers are possible for $\overset{CH(OH)COOH}{\overset{|}{CH}}(Br)\ COOH$?
(A) 2 (B) 3
(C) 4 (D) 8

59. The compound $\frac{H_3C}{H}{>}{=}{<}\frac{COOH}{H}$
(A) E-configuration
(B) Z-configuration
(C) R-configuration
(D) S-configuration

60. Which of the following property has a higher value for trans-isomer as compared to cis-isomer?
(A) Density (B) Dipole moment
(C) Melting point (D) Boiling point

61. Which configuration has lowest potential energy?
(A) Eclipsed (B) Staggered
(C) Skew
(D) All have same energy

62. Cis-2-Butene on reaction with bromine gives 2,3-dibromobutane which is
(A) Racemic mixture (B) Meso-isomer
(C) Dextroisomer (D) Laevoisomer

63. How many stereoisomers are possible for $CH_3CH{=}CHCHCH(Br)CH_3$?
(A) 2-Geometrical isomers
(B) 2-Optical isomers
(C) 2-Geometrical and 2-optial isomers
(D) 2-Geometrical and 1 optical isomer

64. Process of separating the racemic mixture into optically active isomers is known as
(A) Resolution (B) Racemisation
(C) Walden inversion
(D) Epimerization

65. Lactic acid is a molecule which shows
(A) Epimersim (B) Tantomerism
(C) Optical isomerism
(D) Metamerism

66. Which of the following compound will be optically active?
(A) Succinic acid
(B) Meso-tartaric acid
(C) Acetic acid (D) Lactic acid

67. It is possible to distinguish between optical isomers
(A) Using chemical tests
(B) By mass spectrometry
(C) By 1R spectroscopy
(D) By polarimetry

68. Plane polarized light is affected by
(A) Identical molecules
(B) All polymers (C) Chiral molecules
(D) All biomolecules

69. A molecule is said to be chiral
(A) If it contains plane of symmetry
(B) If it contains centre of symmetry
(C) If it cannot be superimposed on its mirror image
(D) If it can be superimposed on its mirror image

70. An optically active compound
(A) Must contain at least favour carbons
(B) When in solution rotate the plane of polarized light
(C) Must always contain an asymmetric carbon atom
(D) In solution always gives negative reading in polarimetre

71. Which of the following compounds will not show geometrical isomerism?
(A) FCH=CHBr (B) BrCH= CHCl
(C) CH3-CH_2Br (D) ICH= CHCl

72. In *t*-butyl alcohol, the tertiary carbon is bonded to:
(A) Three carbon atoms
(B) Three hydrogen atoms
(C) One hydrogen atoms
(D) No hydrogen atoms

73. Which of the following groups has the highest priority according to the Cahn-Ingold-Prelog sequence rules?
(A) $-CH_3$ (B) $-CH_2Cl$
(C) -OH (D) -CHO

74. Which of the following groups has the highest priority according to the Cahn-Ingold-Prelog sequence rules?
(A) -C≡CH (B) $-CH=CH_2$
(C) $-CH_2CH_2CH_3$ (D).$-CH_2CH_2OH$

75. Asymmetric center is characterized by
(A) Having more than one functional groups attached to carbon
(B) Sp3 carbon with 4 different groups attached to carbon
(C) Not having mirror image after a roatation of 180 degree.
(D) All of above

76. Optical activity is
(A) Measure to evaluate degree of rotation of subtituents in a chiral molecule
(B) The ability to rotate the plane of plane –polarized light
(C) To identify the direction of light (right or left) when it is targeted to chiral molecule
(D) None of these

77. Chiral compound are always
(A) Have acidic protons
(B) Have enantiomers
(C) Have distreomers
(D) Optically active

78. Diethyl ether and methyl propyl ether are
(A) Chain isomers (B) Tautomers
(C) Streoisomers
(D) Position isomers

79. Which one is not a type of stereoisomer?
(A) Geometrical isomers
(B) Optical isomers
(C) Conformational isomers
(D) Tautomers

80. Geometrical isomerism is emerged because of
(A) High electron density between two substituted carbon
(B) Restricted rotation of substituents around double bond
(C) Both a & (D) None of these

81. In E, Z nomenclature of stereoisomers, E will be assigned to
(A) The geometrical isomers having higher priority group on opposite direction
(B) If higher priorty group on same direction
(C) Both a & b
(D) None of these

82. In optical isomerism
(A) Laevorotatory are represented by (-) sign
(B) Dextrorotatory are represented by (-) sign
(C) Both a & b are wrong
(D) Sometimes levo and somtimes dextro are represented by (-) sign

83. Benzene has
(A) Axis of symmetry
(B) Centre of symmetry
(C) Plane of symmetry
(D) All of above

84. Asymmetric carbon is that
(A) Which have chiral centre
(B) Which is attached with four different types of substtuents
(C) Which is attached with three different types of substituents
(D) Both a & b

85. Enantiomers are the stereoisomers which are
(A) Not superimposable to their their mirror images
(B) Which have atleast one chiral centre
(C) Which have atleast two chiral centre
(D) None of these

86. Number of stereoisomers are calculated by 2^n formula
(A) (n) is number chiral centres
(B) (n) is number carbon atoms
(C) (n) is number of substituents
(D) None of these

87. Stereochemistry studies the compound
(A) Optical activity
(B) Rotation of substituents around single bond
(C) Distribution of substituents in carbon skeleton
(D) Spatial arrangement

88. In Relative Configuration D & L are assigned
(A) In relation to glyceraldehyde
(B) In relation to number of possible stereoisomers
(C) Number of chiral centres
(D) None of these

89. Epimers are the strereoisomers of a compound which
(A) Differ in configuration at one chiral centre
(B) Differ in configuration at particular chiral centre in a compound having more than one chiral centres
(C) Differ in configuration at one chiral centre only in cyclic compounds
(D) None of these

90. In studying relative stability of conformational isomers of n-butane
(A) Anti form lies at lowest energy
(B) Skew form lies at lower energy
(C) Both lies at lower energy but somtimes anti goes to higher energy
(D) None of these

ANSWERS

1. A	2. C	3. D	4. B
5. D	6. B	7. B	8. C
9. C	10. B	11. C	12. B
13. C	14. A	15. B	16. D
17. A	18. A	19. C	20. C
21. C	22. A	23. D	24. B
25. B	26. B	27. D	28. C
29. C	30. B	31. D	32. D
33. B	34. C	35. A	36. D
37. C	38. C	39. C	40. C
41. C	42. C	43. C	44. D
45. D	46. D	47. D	48. D
49. D	50. D	51. D	52. D
53. D	54. B	55. B	56. B
57. C	58. C	59. B	60. C
61. B	62. A	63. C	64. A
65. C	66. D	67. D	68. C
69. C	70. B	71. C	72. A
73. C	74. A	75. B	76. B
77. D	78. D	79. D	80. B
81. A	82. A	83. D	84. D
85. A	86. A	87. D	88. A
89. B	90. A		

2.5. CHEMISTRY OF HYDROCARBONS

1. During distillation of coal tar, anthracene is mainly present in
   (A) Light oil (B) Green oil
   (C) Middle oil (D) Heavy oil

2. Petroleum is mainly a source of
   (A) Inorganic compounds
   (B) Cyclohexanes
   (C) Aromatic compounds
   (D) Aliphatic compounds

3. Gasoline contains hydrocarbons in the range
   (A) C-7 to C-12 (B) C-12 to C-15
   (C) C-4 to C-6 (D) C-5 to C-8

4. Coal is mainly a source of
   (A) Inorganic compounds
   (B) Cyclohexanes
   (C) Aromatic compounds
   (D) Aliphatic compounds

5. Which of the following is not present in crude naphtha?
   (A) Paraffin wax
   (B) Petroleum ether
   (C) Gasoline (D) Hexane

6. Octane number of iso-octane is
   (A) 80 (B) 100
   (C) Zero (D) Zero

7. Cetane is
   (A) n-Hexane (B) n-pentadecane
   (C) n-Octane (D) n-Hexadecane

8. The process of heating coal in the absence of air is called
   (A) Cracking
   (B) Decarboxylation
   (C) Decarbonization
   (D) Isomerization

9. During distillation of coal tar, naphthalene is a constituent of
   (A) Middle oil (B) Green oil
   (C) Heavy oil (D) Light oil

10. The %age of carbon is maximum in
    (A) Lignite (B) Anthracite
    (C) Peat (D) Bituminous

11. Coke is obtained by heating coal in the
    (A) Absence of air (B) Presence of air
    (C) Limited supply of air
    (D) Presence of catalyst

12. Which of the following compounds has the maximum octane number?
    (A) 2,2,4-Trimethylpentane
    (B) 2,4-Dimethylhexane
    (C) 2,2,3-Trimethylpentane
    (D) n-Octane

13. Aromatization of *n*-heptane yields
    (A) Benzene (B) Xylene
    (C) Toluene (D) m-Xylene

14. Carbonization of coal is carried out by heating coal at a temperature
    (A) 1000°C (B) 1500°C
    (C) 500°C (D) 2000°C

15. Which of the following compounds show geometrical isomerism?
    (A) Vinyl chloride
    (B) 1,2-Dichloroethene
    (C) Trichloroethene
    (D) 1,1-Dichloroethene

16. How many chain isomers are possible for an alkane having molecular formula C_5H_{12}?
    (A) 5 (B) 3
    (C) 4 (D) 2

17. Successive alkanes differ by
(A) CH (B) CH_3
(C) CH_2 (D) C_2H_5

18. Which of the following reactions can be employed to get unsymmetrical alkanes in good yield?
(A) Birch reaction (B) Wurtz reaction
(C) Corey-House reaction
(D) None of the above

19. Alcoholic solution of caustic potash is a specific reagent for
(A) Dehydration
(B) Dehydrohalogenation
(C) Dehydrogenation
(D) Hydration

20. When an alkyl halide is treated with Na in dry ether, a symmetry alkane is obtained. The reaction is called
(A) Fischer-Tropsch reaction
(B) Grignard raection
(C) Wurtz reaction (D) None of above

21. The reduction of an alkyne to alkene using Lindlar's catalyst results into
(A) *Syn* addition of hydrogen atoms
(B) *Anti* addition of hydrogen atoms
(C) A mixture obtained by *syn* and *anti* addition of hydrogen
(D) None of above

22. The addition of HCl to 2-pentene gives
(A) 3-chloropentane
(B) 2-chloropentyne
(C) 2-chloropentane
(D) 2-chloro-2-methyl butane

23. When propyne is treated with aqueous H_2SO_4 in the presence of $HgSO_4$, the functional isomer of the major product obtained is
(A) Propanal (B) propan-2-ol
(C) Acetone (D) Propanol

24. The relative order of stability of carbocations $R\overset{+}{C}=CH_2$, $R\overset{+}{C}H_2$ and $RCH=\overset{+}{C}H$ is
(A) $R\overset{+}{C}=CH_2 > R\overset{+}{C}H_2 > RCH=\overset{+}{C}H$
(B) $R\overset{+}{C}=CH_2 < R\overset{+}{C}H_2 < RCH=\overset{+}{C}H$
(C) $R\overset{+}{C}=CH_2 > R\overset{+}{C}H_2 < RCH=\overset{+}{C}H$
(D) $R\overset{+}{C}=CH_2 < R\overset{+}{C}H_2 > RCH=\overset{+}{C}H$

25. Which of the following is most suitable reagent to distinguish compound (III) from the rest of the compounds?
(I) $CH_3C\equiv CCH_3$
(II) $CH_3CH_2CH_2CH_3$
(III) $CH_3CH_2C\equiv CH$
(IV) $CH_3-CH=CH-CH_3$
(A) Br_2/CCl_4 (B) Br_2/CH_3COOH
(C) Alkaline $KMnO_4$
(D) Tollen's reagent

26. Who proved that all the six hydrogen atoms in benzene are equivalent?
(A) Kekule (B) Ladenburg
(C) Faraday (D) Wohler

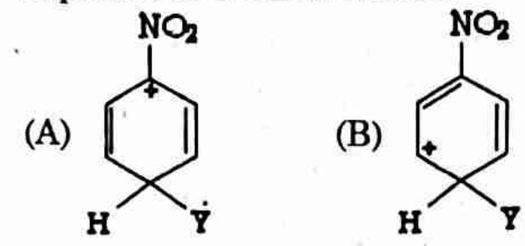
27. Each of the following compound is an aromatic except
(A) Benzene (B) Naphthalene
(C) Cyclopentadienyl cation
(D) Cyclopentadienyl anion

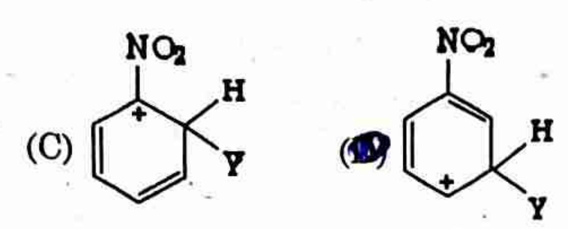
28. Sodium propionate on decarboxylation with soda-lime gives
(A) Propane (B) Ethane
(C) Butane (D) Pentane

29. Ethyne can be prepared from a single step from
(A) Calcium carbide
(B) Ethylidene bromide
(C) Ethylene bromide (D) All bobe

30. Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH gives
(A) o-cresol (B) p-cresol
(C) 2,4-dihydroxy toluene
(D) Benzoic acid

31. Which of the following carbocations is expected to be most stable?

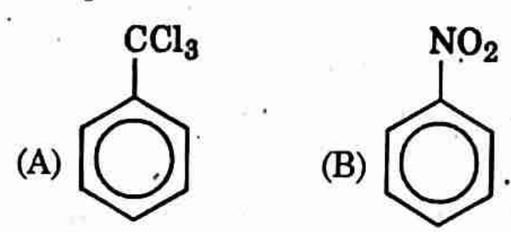


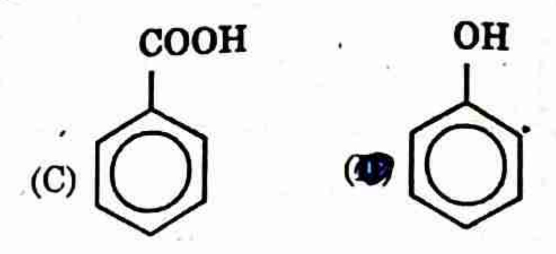


32. Among the following statements on the nitration of aromatic compounds, the false one is
   (A) The rate of nitration of benzene is almost the same as that of hexadeutero-benzene
   (B) The rate of nitration of toluene is greater than that of benzene
   (C) The rate of nitration of benzene is greater than that of hexadeutero benzene
   (D) Nitration is an electrophilic substitution reaction

33. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In the nitrating mixture, HNO_3 acts as a/an
   (A) Base (B) Acid
   (C) Oxidizing agent
   (D) Catalyst

34. Each of the following compound gives a meta nitro compound on nitration except

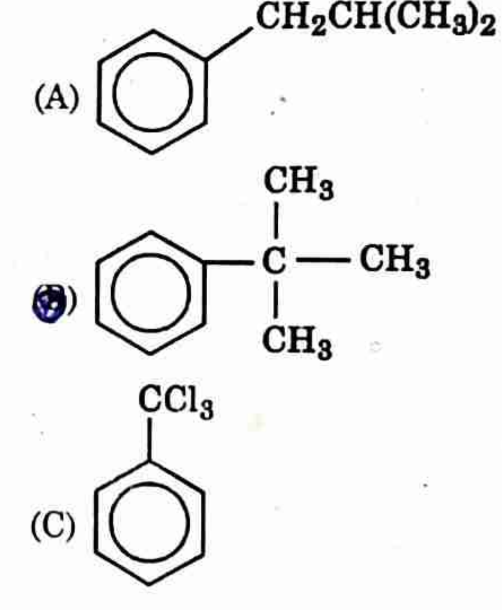


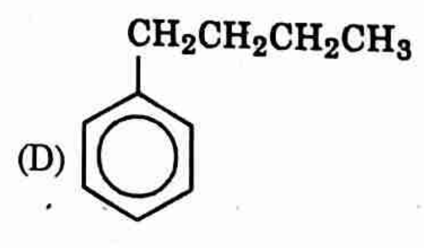


35. The electrophile in the sulphonation of benzene is
   (A) SO_3 (B) SO_3H
   (C) HSO_4^- (D) SO_2

36. Which of the following reactions can be used to prepare alkane from an alkyl halide?'
   (A) Kolbe reaction
   (B) Wurtz reaction
   (C) Fittig reaction
   (D) None of these

37. Alkylation of benzene with isobutene in the presence of sulphuric acid gives

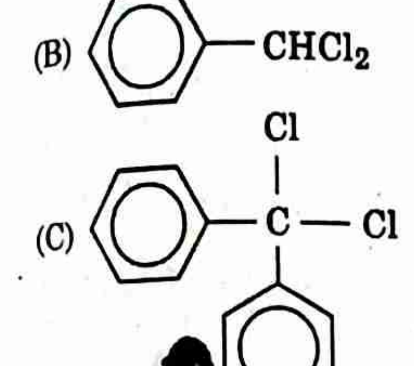


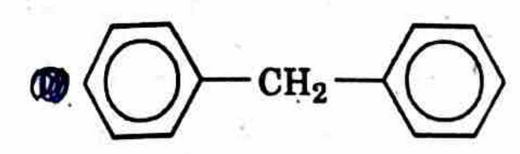


38. Which of the following structures corresponds to the product expected, when excess of benzene reacts with dichloromethane in the presence of anhydrous $AlCl_3$?

(A) $C_6H_5-CH(C_6H_5)-Cl$

(B) $C_6H_5-CHCl_2$

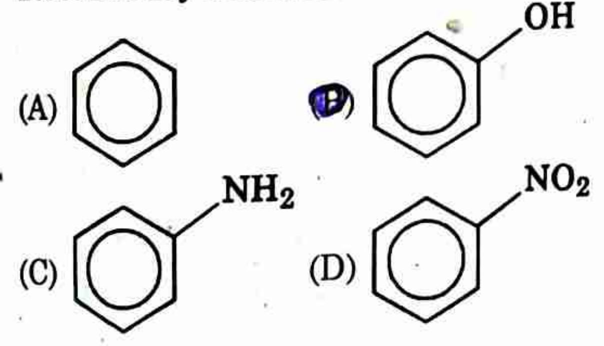
(C) 

(D) 

39. Which of the following cannot be prepared by Wurtz reaction?

(A) C_2H_6 (B) CH_4
(C) C_3H_8 (D) C_4H_{10}

40. Which of the following compound is most readily nitrated?



41. Which of the following alkanes cannot be synthesized by Kolbe reaction of sodium salt of carboxylic acid?

(A) Butane (B) Hexane
(C) Ethane (D) Methane

42. The hemolytic fission of hydrocarbon results in the formation of

(A) Carbocation (B) Free rdaical
(C) Carboanion (D) Carbene

43. In the given reaction

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH=CH_2 + HCl \rightarrow [X]$$

Major product [X] will be

(A) 2-chloro-3-methylbutane
(B) 1-chloro-3-methylbutane
(C) 2-chloro-2-methylbutane
(D) 2-chloropentane

44. Chlorination of an alkane involves the attack of

(A) A free radical (B) A base
(C) A nucleophile (D) An electrophile

45. Complete oxidation of ethane yields

(A) CO_2 and H_2O (B) Ethanol
(C) Ethanl (D) Ethanoic acid

46. Which of the following compounds is liquid at room temperature?

(A) C_4H_{10} (B) C_3H_8
(C) $C_{15}H_{32}$ (D) $C_{20}H_{42}$

47. The state of hybridization of carbon in methane is

(A) sp (B) sp3
(C) sp2 (D) dsp2

48. Formation of alkane by the action of Zn dust is called

(A) Wittig reaction
(B) Wurtz raection
(C) Frankland,s reaction
(D) Kolbe reaction

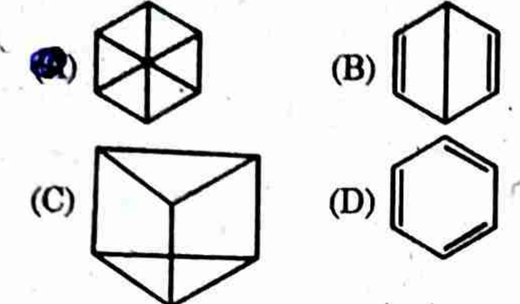
49. In the reaction

$$CH_3-CH_2-CBr_3 \xrightarrow{\text{Ag power}/\Delta} [X]$$

the product [X] is

(A) Propyne
(B) $CH_3-C\equiv C-Ag$
(C) 3-Hexyne (D) 3-Hexene

50. Which among the following is Claus formula of benzene



51. Which of the following catalyst is used in the reduction of carbonyl group to -CH_2

(A) Zn dust (B) Zn/Hg
(C) Pt (D) Ni

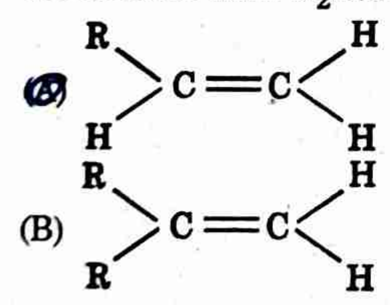
52. $(CH_3)_3CMgCl$ on reaction with D_2O produces

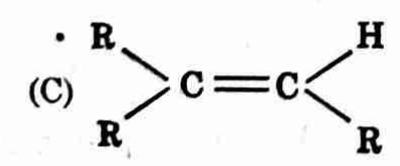
(A) $(CH_3)_3$ CD (B) $(CH_3)_3$ COD
(C) $(CD_3)_3$ CD (D) $(CD_3)_3$ OD

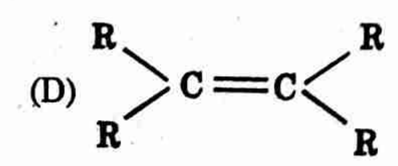
53. 1-Butyne on oxymercuration-demercuration would give

(A) Butanone (B) Butanal
(C) Propanol and methanol
(D) Propanoic acid and formic acid

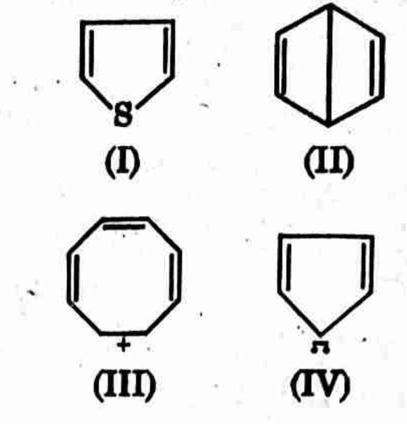
54. Which of the following alkenes will react faster with H_2/catalyst?





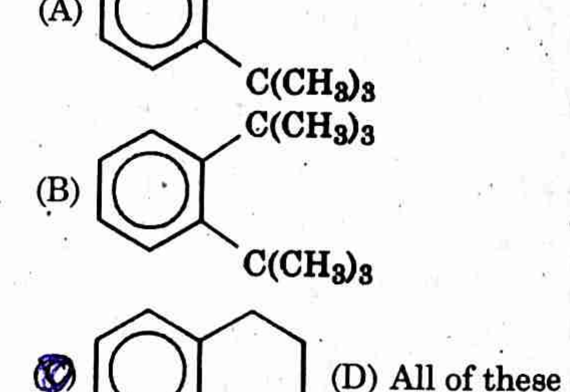


55. Which of the following is NOT an aromatic compound?



(A) II and III (B) Only II
(C) II, III and IV (D) I and II

56. Which of the following on vigorous oxidation with hot alkaline $KMnO_4$ will form benzene-1-dicarboxylic acid?



(C) (D) All of these

57. Preparation of vegetable ghee involves

(A) Halogenation (B) Hydroxylation
(C) Dehydrogenation
(D) Hydrogenation

58. Ethyl bromide reacts with Zn and HCl to form

(A) Ethene (B) Ethane
(C) Ethyne (D) Propyne

59. The most reactive hydrocarbon is

(A) Acetylene (B) Heptane
(C) Ethene (D) Ethane

60. $CH_3(CH_2)_5CH_3 \longrightarrow$, the reaction involved in the above conversion is
(A) Cracking (B) Refining
(C) Fischer-Tropsch synthesis
(D) Reforming

61. Toluene is o/p-orienting with respect to an electrophilic substitution reaction due to
(A) +I effect of the methyl group
(B) +I as well as +R effect of the methyl group
(C) Hyper conjugation between the methyl group and phenyl ring
(D) +R effect of the methyl group

62. The substitution reaction in acetylene is possible by
(A) Na metal (B) $NaNH_2$
(C) Ammonical $AgNO_3$
(D) All above

63. The addition of unsymmetrical reagent to an unsymmetrical alkene is in accordance with the rule of
(A) Hund,s rule
(B) Markownikov,s rule
(C) Anti-Marknownikov,s rule
(D) Pauli's principle

64. In the Friedel-Craft acylation, the amount of $AlCl_3$ that must be taken is
(A) In catalytic amount
(B) One equivalent
(C) More than one equivalent
(D) Amount does not matter

65. Unsaturated nature of alkene can be detected by
(A) Decolorisation of bromine water
(B) Decolorisation of $KMnO_4$ solution
(C) Ozonolysis (D) All above

66. What types of reactions are given in alkanes?
(A) Polymerization (B) Substitution
(C) Elimination (D) Addition

67. Benzene does not undergo
(A) Addition (B) Substitution
(C) Elimination (D) Polymerization

68. Which of the following could be used as catalyst in Friedal-Craft reaction?
(A) $BeCl_2$ (B) HNO_3
(C) NaCl (D) $AlCl_3$

69. During nitration of benzene, the active nitrating agent is
(A) NO_3 (B) NO_2^-
(C) NO (D) NO_2^+

70. Which of the following could be used as electrophile in aromatic substitution?
(A) H_2SO_4 (B) HSO_4^-
(C) SO_3^+ (D) SO_3

71. The C-H bond length in benzene is
(A) 1.12Å (B) 0.99Å
(C) 1.37Å (D) 1.09Å

72. Aromatic hydrocarbons undergo
(A) Nucleophilic addition reaction
(B) Electrophilic addition reaction
(C) Electrophilic substitution reactions
(D) None of above

73. During electrophilic substitution in benzene the intermediate species involved is
(A) Carbocation (B) Carbanion
(C) Free radical (D) None of above

74. Benzene reacts with excess of chlorine in sunlight to form
(A) Chlorobenzene
(B) Dichlorobenzene
(C) Trichlorobenzene
(D) Benzene hexachloride

75. Benzene on ozonolysis yields
(A) Glyoxal (B) Acetone
(C) Ethanal (D) Methanal

76. Resonance energy of benzene is
(A) 150 kJ/mol (B) 100 kJ/mol
(C) 200 kJ/mol (D) 300 kJ/mol

77. Alkaline $KMnO_4$ oxidizes acetylene to
(A) Acetic acid
(B) Oxalic acid
(C) Glyoxal
(D) Ethylene glycol

ANSWERS

1. B	2. D	3. A	4. C
5. A	6. B	7. D	8. C
9. A	10. B	11. A	12. C
13. C	14. A	15. B	16. B
17. C	18. C	19. B	20. C
21. A	22. C	23. A	24. A
25. D	26. B	27. C	28. D
29. B	30. D	31. D	32. C
33. A	34. D	35. A	36. B
37. B	38. D	39. B	40. B
41. D	42. B	43. B	44. A
45. A	46. C	47. B	48. C
49. C	50. A	51. B	52. A
53. A	54. A	55. A	56. C
57. D	58. B	59. C	60. D
61. C	62. C	63. B	64. A
65. D	66. D	67. D	68. D
69. D	70. D	71. D	72. C
73. A	74. D	75. A	76. A
77. B			

2.6. CHEMISTRY OF HALOGENATED ORGANIC COMPOUNDS

1. Monohaloderivatives of alkanes are called
(A) Alkyl halides (B) Aryl halides
(C) Allyl halides (D) None of above

2. Which of the following method is used to prepare any alkyl halide?
(A) $ROH + PCl_5 \longrightarrow ROH + HCl + POCl_3$
(B) $ROH + PCl_3 \longrightarrow RCl + H_3PO_3$
(C) $ROH + SOCl_2 \rightarrow RCl + SO_2 + HCl$
(D) $ROH = HCl \xrightarrow{ZnCl_2} RCl + H_2O$

3. How many structural isomers are possible for C_4H_9Br
(A) 5 (B) 2
(C) 4 (D) 3

4. Chlorination of benzene with excess chlorine in the presence of $FeCl_3$ as Lewis acid gives
(A) Chlorobenzene as a major product
(B) o-dichlorobenzene as major product
(C) p-dichloro benzene as an only product
(D) A mixture of o- and p-dichlorobenzene

5. The best reagent for converting an alcohol into the corresponding chloride is
(A) PCl_5 (B) PCl_3
(C) Zn/HCl (D) $SOCl_2$

6. A reaction in which an atom or group in a molecule is replaced by another atom or molecule is called
(A) Addition reaction
(B) Elimination reaction
(C) Cycloaddition reaction
(D) Substitution reaction

7. Silver salt of a carboxylic acid upon refluxing with bromine in CCl_4 gives the corresponding alkyl halide. The reaction is known as
(A) Wittig reaction
(B) Kolbe raection
(C) Fittig reaction
(D) Hunsdiecker reaction

8. Which of the following reagents cannot be used for the synthesis of alkyl halides from an alcohols?
(A) Zn/HCl (B) PCl_3
(C) PCl_5 (D) $SOCl_2$

9. Which of the following is not nucleophile?
(A) H_2O (B) H_2S
(C) BF_3 (D) NH_3

10. Alkyl halides react with Zn-metal to form alkanes. The reaction is called
(A) Wurtz,s reaction
(B) Fittig,s reaction
(C) Clemensin,s reduction
(D) Frankland,s reaction

11. Which of the following alkyl halides is the most reactive towards attacking nucleophil?
(A) CH_3F (B) CH_3Br
(C) CH_3I (D) CH_3Cl

12. Ethyl chloride reacts with silver oxide in the presence of moisture to form
(A) Ethanol (B) Ether
(C) Acetone (D) Acetic acid

13. 1-Bromobutane on reaction with alcoholic potassium hydroxide gives
(A) 1-butanal (B) 2-butene
(C) 1-butyne (D) 1-butene

14. Which of the following is not a nucleophile?
(A) Cl^- (B) Br^-
(C) OH^- (D) CH_3^+

15. The S_N2 reaction can be best carried out with
(A) Tertiary Alkyl halides
(B) Secondary alkyl halides
(C) Primary alkyl halides
(D) All above

16. The S_N1 reaction can be best carried out with
(A) Tertiary Alkyl halides
(B) Secondary alkyl halides
(C) Primary alkyl halides
(D) All above

17. The rate of nucleophilic substitution reaction depends on
(A) Structure of substrate
(B) Nature of solvent
(C) Nature of nucleophile
(D) All above

18. Which of the following chloride is the most reactive towards uni-molecular nucleophilic substitution reactions?
(A) Benzyl chloride
(B) t-butyl chloride
(C) n-propyl chloride
(D) iso-butyl chloride

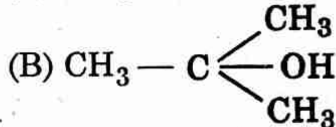
19. Reactions in which two atoms or groups are remove from two adjacent C-atoms of the substrate molecules to for a multiple bond are called
(A) Inversion (B) Addition
(C) Substitution
(D) Beta-elimination

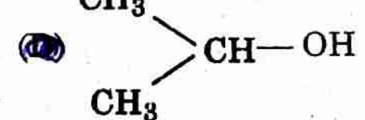
20. In beta-elimination reaction, the nucleophile attacks on
(A) Gamma-H (B) Alpha-H
(C) Alpha-C (D) Beta-H

21. The substance which donates a pair of electrons to electrophile are
(A) Electrophile (B) Nucleophile
(C) Lewis acid (D) None of above

22. In unimolecular reactions, the reaction completes in
(A) Three steps (B) Single step
(C) Two steps (D) None of above

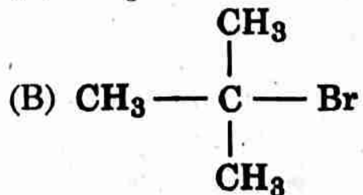
23. Which of the following is not associated with SN2 mechanism?
(A) Inversion of configuration
(B) Change of hybridization from sp3 to sp2 in transition
(C) Second order kinetics
(D) Tertiary alkyl halide

24. Which of one of the following gives haloform reaction?
(A) $CH_3—O—H$
(B) 

(C) Propanol
(D) 

25. Grignard reagent is reactive due to
(A) Presence of halogen atom.
(B) Presence of Mg atom
(C) The polarity of C-Mg bond
(D) Electrophilic carbon

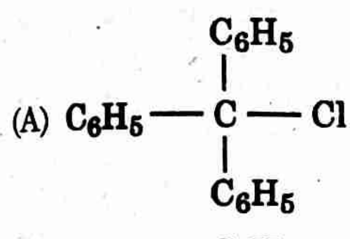
26. Reaction of RMgBr with CO_2 is an example of
(A) Electrophilic addition
(B) Nucleophilic addition
(C) Nucleophilic substitution
(D) Simple addition

27. Which among the following compound will give S_N^2 reaction with NaOH?
(A) $CH_3—I$
(B) 

(C) $CH_3 - \underset{C_6H_5}{\overset{CH_3}{C}} - Cl$

(D) $C_6H_5 - \underset{C_6H_5}{\overset{C_6H_5}{C}} - Cl$

28. Which among the following compound will give enantiomeric pair on treatment with HOH?

(A)


(B) $C_6H_5 - \underset{CH_3}{\overset{C_6H_5}{C}} - Cl$

(C) $C_6H_5 - \underset{CH_3}{\overset{H}{C}} - I$

(D) $CH_3 - \underset{C_6H_5}{\overset{CH_3}{C}} - Br$

29. Which among the following is not nucleophile?

(A) CH_3NH_2 (B) $CH_2{=}CH_2$

(C) CH_3^+ (D) OH^-

30. In S_N2 reaction which compound will give Walden Inversion?

(A) $CH_3 - CH_2 - Br$

(B) $CH_3 - \overset{D}{CH} - Br$

(C) $CH_3 - Br$

(D) $C_6H_5 - CH_2 - CH_2 - Cl$

31. Following is the list of four halides. Select correct sequence of decreasing order of reactivity for S_N reaction using the codes given below

(1) $C_6H_5 - \underset{CH_3}{CH} - Br$

(2) $C_6H_5 - CH_2 - Br$

(3) $C_6H_5 - \underset{CH_3}{CH} - I$

(4) $C_6H_5 - CH_2 - Cl$

The correct answer is

(A) 3, 1, 2, 4 (B) 1, 3, 2, 4

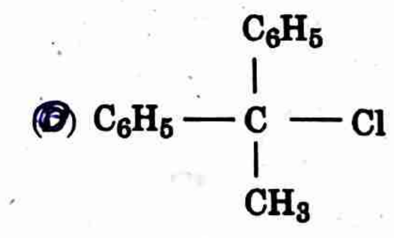
(C) 2, 4, 3, 1 (D) 4, 2, 3, 1

32. Which among the following will give S_N1 reaction?

(A) $CH_3 - \underset{C_6H_5}{CH} - Br$

(B) $CH_3 - CH_2 - Br$

(C) $CH_3 - CH_2 - I$

(D)


33. Which of the following factors affect elimination reaction?

(A) Effect of substrate structure

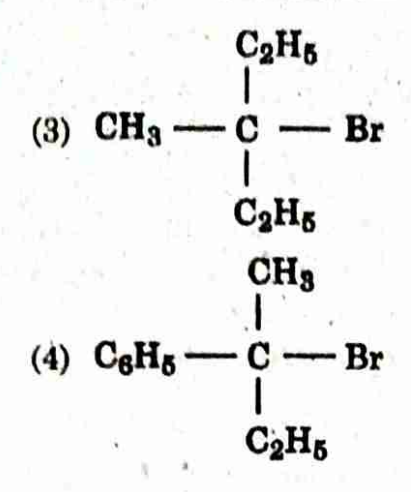
(B) Effect of temperature

(C) Solvent affect (D) All above

34. Which among the following compound will show retention as well inversion in hydrolysis reaction?

(1) $C_6H_5 - CH_2Br$

(2) $C_6H_5 - CHD - Br$



The correct answer is
(A) 2, 4 (B) 1, 2
(C) 3, 4 (D) 2, 3, 4

35. Acetic acid can be obtained from CH_3MgI by treatment with
(A) H_2O (B) HCHO
(C) CO_2 (D) $ClNH_2$

36. Methanol can be obtained from CH_3MgI by treatment with
(A) H_2O (B) O_2
(C) CO_2 (D) $ClNH_2$

37. The reagent which can react with 1-chlorobutane to give substitution product is
(A) $AlCl_3$
(B) KOH — CH_3OH
(C) NaCN (D) Mg/ether

38. Ketone can be obtained from CH_3MgI by treatment with
(A) H_2O (B) HCHO
(C) CO_2 (D) CH_3CN

39. The number of optically active compounds in the isomers of $C_3H_5Br_3$ is
(A) 1 (B) 2
(C) 3 (D) 4

40. Among the following, a good solvent for a Grignard reagent formation would be
(A) t-butanol (B) dimethyl ether
(C) difluoro ethane
(D) tetrahydrofuran

41. Tertiary alcohol can be obtained from CH_3MgI by treatment with
(A) H_2O (B) HCHO
(C) CO_2 (D) Ketone

42. Seconday alcohol can be obtained from CH_3MgI by treatment with
(A) H_2O (B) HCHO
(C) CH_3CHO (D) $ClNH_2$

43. Which one of the following would make an S_N^2 mechanism more likely?
(A) Bulky substituents near the halogen
(B) A polar solvent
(C) A tertiary carbocation intermediate
(D) A reactive nucleophilic

44. For which of the following compounds is the rate of hydrolysis by aqueous alkali most likely to be independent of the hydroxide ion concentration?
(A) 1-chlorobutane (B) 2-bromobutane
(C) 1-iodobutane
(D) 2-bromo-2-methyl butane

45. Vicinal dihalides also undergo both substitution and elimination reactions. The best reagent used to convert Cl — CH_2 — CH_2 — Cl into $CH \equiv CH$ is
(A) Hot sodium hydroxide in ethanol
(B) Hot sodamide
(C) Hot aqueous sodium hydroxide
(D) Hot and ethanolic potash

ANSWERS

1. A	2. A	3. C	4. D
5. D	6. D	7. D	8. A
9. C	10. D	11. C	12. A
13. D	14. D	15. C	16. A
17. D	18. A	19. D	20. D
21. B	22. C	23. D	24. D
25. B	26. B	27. A	28. C
29. C	30. B	31. A	32. D
33. D	34. A	35. C	36. B
37. C	38. D	39. B	40. D
41. D	42. C	43. D	44. D
45. B			

2.7. CHEMISTRY OF CARBONYL COMPOUNDS

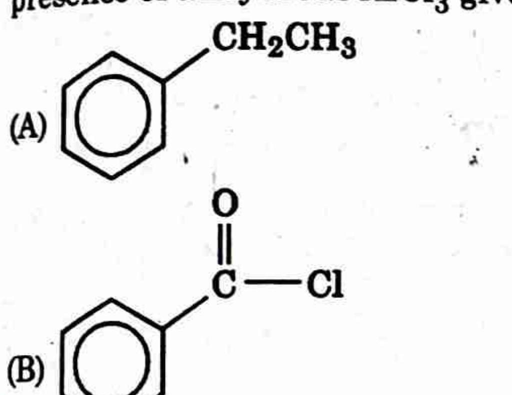
1. The C-atom in aldehyde and ketone is _____ hybridized

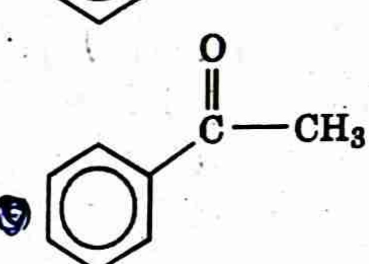
   (A) sp3 (B) sp
   (C) sp2 (D) dsp

2. Which of the following is least reactive?

   (A) C_2H_5CHO (B) CH_3CHO
   (C) C_6H_5CHO (D) HCHO

3. Ethanoylation of benzene in the presence of anhydrous $AlCl_3$ gives





   (D) C_6H_5—C(=O)—CHO

4. Which of the following statements regarding carbonyl group is not correct?

   (A) The carbon atom of carbonyl group in aldehydes is sp^2 hybridised
   (B) The carbon atom of carbonyl group in the transition state formed during the addition reaction across the carbonyl group is sp^3 hybridised
   (C) The aryl group in aromatic aldehydes speeds up the addition reaction across the carbonyl group
   (D) An aryl group stabilizes the aldehyde more than the transition state

5. Reactivity of carbonyl compounds is

   (A) Electrophilic carbon
   (B) Less steric hindrance
   (C) Unsaturation
   (D) All aboves

6. The correct order of reactivity of CH_3CHO, $C_2H_5COCH_3$ and CH_3COCH_3 is

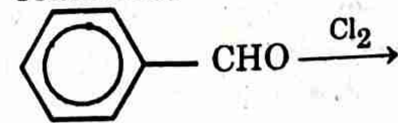
   (A) $CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$
   (B) $C_2H_5COCH_3 > CH_3COCH_3 > CH_3CHO$
   (C) $CH_3COCH_3 > CH_3CHO > C_2H_5COCH_3$
   (D) $CH_3COCH_3 > C_2H_5COCH_3 > CH_3CHO$

7. A $\xrightarrow[\text{(ii) dil. } H_2SO_4]{\text{(i) HCN}}$ α-hydroxy propionic acid

   The structure of A is

   (A) CH_3COOH
   (B) $CH_2{=}CH-COOH$
   (C) CH_3CHO (D) CH_3COCH_3

8. The final product of the following reaction is



(A) $C_6H_5-CH(OH)-Cl$

(B) $C_6H_5-CH(OH)-COOH$

(C) C_6H_5-COCl

(D) $C_6H_5-CO-CO-C_6H_5$

9. Which of the following will not show haloform reaction?
   (A) C_6H_5CHO (B) CH_3CHO
   (C) CH_3COCH_3 (D) $C_6H_5COCH_3$

10. What is a mixed ketone?
   (A) Acetone (B) Acetophenone
   (C) Benzophenone (D) Diethyl ketone

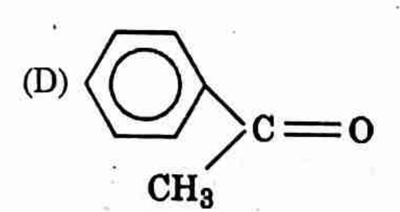
11. Which of the following aldehydes is most reactive?
   (A) C_6H_5CHO (B) CH_3CHO
   (C) C_2H_5CHO (D) HCHO

12. The condensation between formaldehyde and acetaldehyde in the presence of conc. NaOH and heat gives
   (A) Acrolein
   (B) Mixture of CH_3OH and $CH_3COO^-Na^+$
   (C) Mixture of CH_3CH_2OH and $HCOO^-Na^+$
   (D) None of these

13. $C_6H_{11}-C\equiv CH \xrightarrow[HgSO_4]{dil.H_2SO_4}$ 'A'
   'A' does not give a reaction with solution of copper sulphate and Rochelle's salt. The structure of the isomer of A will be
   (A) $C_6H_{11}-COCH_3$ (cyclohexyl)
   (B) $C_6H_{11}-CH_2CHO$ (cyclohexyl)
   (C) $C_6H_5-C\equiv CH$
   (D) $C_6H_{11}-CHO$ (cyclohexyl)

14. The reagent which can be used to distinguish acetophenone from benzophenone is
   (A) 2,4-dinito phenyl hydrazine
   (B) $LiAlH_4$
   (C) Benedict reagent
   (D) I_2 and Na_2CO_3

15. Which of the following compounds will not form hydrazone?
   (A) C_6H_5-CHO
   (B) $C_6H_5-C(=O)-C_6H_5$
   (C) $(CH_3)(C_2H_5)C=O$
   (D)



16. Ketones are prepared by the oxidation of
   (A) 1° Alcohol (B) 2° Alcohol
   (C) 3 ° Alcohol (D) None of these

17. When a formaldehyde solution is evaporated to dryness, a white crystalline solid is obtained. This is known as
(A) Para formaldehyde
(B) Hexa methylene tetramine
(C) Trioxy methylene
(D) Formose

18. Which of the following does not give Cannizzaro,s reaction?
(A) Benzophenone (B) Benzaldehyde
(C) Formaldehyde (D) Acetaldehyde

19. Which of the following tests is given by ketone?
(A) Fehling solution test
(B) Sodium nitroprusside test
(C) Tollen,s reagent test
(D) Schiff reagent test

20. Which of the following will undergo nucleophilic addition reaction more easily?
(A) Amines (B) Ketone
(C) Aldehyde (D) Alkene

21. Aldol consists of
(A) Aldehyde group
(B) Hydroxyl group
(C) Carboxylic group
(D) Both A and B

22. Which of the following is the strongest reducing agent?
(A) C_3H_7OH (B) CH_3COCH_3
(C) C_2H_5OH (D) HCHO

23. Which of the following reagent will react with both aldehyde and ketone?
(A) Grignard reagent
(B) Tollen,s reagent
(C) Fehling,s reagent
(D) Sodium nitroprusside

24. Acetone can be converted into pinacol by
(A) Mg/Hg (B) Zn/Hg
(C) Na/Hg (D) All of these

25. Which of the following compounds will not give iodoform test on treatment with I_2/NaOH?
(A) Acetone (B) 3-Pentanone
(C) 2-Butanone (D) Acetaldehyde

26. When aldehyde reacts with Tollen,s reagent:
(A) A ketone is formed
(B) An alcohol is formed
(C) Ag+ ions are produced
(D) Ag^+ ions are reduced

27. The red brown ppt of Fehling solution and Benedict solution tests are of:
(A) AgBr (B) Ag
(C) CuO (D) Cu_2O

28. Crabonyl compounds react with hydroxylamine to form
(A) Hyrazone (B) Oxime
(C) Cyanohydrin (D) None of above

29. Which of the following test is not given by aldehyde?
(A) Fehling solution test
(B) Sodium nitroprusside test
(C) 2,4-DNP test (D) $NaHSO_3$ test

30. Paraldehyde is used as:
(A) Poison (B) Dye
(C) Medicine (D) Polymer

31. During the reduction of aldehyde with $NH_2—NH_2/OH^-$, the first intermediate compound formed is
(A) RCN (B) $RCONH_2$
(C) $R—CH=NH$
(D) $R—CH=NNH_2$

32. Schiff's reagent gives pink colour with
(A) Acetaldehyde (B) Acetone
(C) Acetic acid (D) Methyl acetate

33. Ketone on reduction produce:
(A) Primary alcohol
(B) Secondary alcohol
(C) Tertiary alcohol
(D) Acetic acid

34. Which of the following has most acidic hydrogen?
(A) 3-hexanone
(B) 2,4-hexanedione
(C) 2,5-hexanedione
(D) 2,3-hexanedione

35. Which among the following is used as a reagent in laboratory for the detection of carbonyl group?
(A) $C_6H_5NH_2$
(B) $NH_2—NH—\overset{\overset{\displaystyle O}{\|}}{C}—NH_2$
(C) NH_2OH
(D) 2,4-dinitrophenyl hydrazine

36. Industrial production of acetaldehyde is done by
(A) Oxidation of ethanol
(B) Reduction of acetic acid
(C) Oxidation of ethylene in the presence of Pd^{2+}
(D) Hydration of acetylene

37. In which of the following compounds, carbon number is decreased during oxidation
(A) Ketone (B) Aldehyde
(C) Formaldehyde (D) Ethanol

38. Calcium formate on dry distillation yields
(A) Formaldehyde (B) Acetaldehyde
(C) Ketone (D) Formic acid

39. Which of the following reactions is not given by acetone?
(A) Reduction of Fehling's solution
(B) Iodoform reaction
(C) Formation of an addition compound with sodium hydrogen sulphite
(D) Formation of crystals with 2,4-dinitrophenyl hydrazine

ANSWERS

1. C	2. C	3. C	4. C
5. D	6. A	7. C	8. D
9. A	10. B	11. D	12. A
13. B	14. D	15. B	16. D
17. A	18. D	19. B	20. C
21. B	22. D	23. D	24. A
25. B	26. D	27. D	28. B
29. B	30. C	31. D	32. A
33. B	34. B	35. D	36. C
37. A	38. A	39. A	

2.8. CHEMISTRY OF CARBOXYLIC ACIDS

1. Oxidation of primary alcohol and aldehyde yields
(A) Ketones (B) Phenols
(C) Carboxylic acids
(D) Oxime

2. Which of the following compounds on hydrolysis yields acetic acid?
(A) CH_3CO_2MgX (B) $CH_3C \equiv N$
(C) $CH_3COOCOCH_3$
(D) All these

3. Aromatic acids can be prepared by the oxidation of alkyl side chain on the benzene ring with
(A) Alkaline $KMnO_4$
(B) Acidic $K_2Cr_2O_7$
(C) Chromic acid
(D) All above

4. The relative order of esterification of acids is
(A) $RCH_2CO_2H > R_2CHCO_2H > R_3CCO_2H$
(B) $RCH_2CO_2H < R_2CHCO_2H < R_3CCO_2H$
(C) $RCH_2CO_2H < R_3CCO_2H < R_2CHCO_2H$
(D) $R_3CCO_2H > RCH_2CO_2H > R_2CHCO_2H$

5. Organic compounds having carbon-carbon double bond undergo cleavage at the point of unsaturation when subjected to oxidation with alkaline $KMnO_4$ yield
(A) Aldehydes (B) Ketones
(C) Alcohols
(D) Carboxylic acids

6. Hydrolysis of nitriles with aqueous acid or alkali yields ——— with a chain one carbon atom longer than the original chain
(A) Aldehydes (B) Ketones
(C) Alcohols
(D) Carboxylic acids

7. Carbonation of Grignard reagents results in the formation of
(A) Aldehydes (B) Ketones
(C) Alcohols
(D) Carboxylic acids

8. Which of the following acids is the strongest acid?
(A) CH_3COOH (B) $HCOOH$
(C) C_2H_5COOH (D) C_3H_7COOH

9. Which of the following is neutral amino acids?
(A) Histidine (B) Lysine
(C) Glycine (D) Aspartic acid

10. The amino acids which a body can synthesize are called
(A) Essential (B) Non-essential
(C) Acidic (D) Basic

11. Amino acids are classified into following types:
(A) Neutral (B) Acidic
(C) Basic (D) All types

12. Which of the following acids is the strongest acid?
(A) $BrCH_2COOH$ (B) $ClCH_2COOH$
(C) FCH_2COOH (D) ICH_2COOH

13. Which of the following electron-withdrawing group increase the acidity of the carboxylic acids?
(A) -Cl (B) -OH
(C) -CN (D) All

14. Which of the following electron-donating group decrease the acidity of the carboxylic acids?
(A) -Cl (B) $-CH_3$
(C) -CN (D) -OH

15. Which of the following acids is strong?
(A) Benzoic acid
(B) m-nitrobenzoic acid
(C) o-nitrobenzoic acid
(D) *p*-nitrobenzoic acid

16. Which of the following acids is strong?
(A) Benzoic acid
(B) m-chlorobenzoic acid
(C) o-chlorobenzoic acid
(D) *p*-chlorobenzoic acid

17. Carboxylic acids for acid halides by reacting with
(A) PCl_3 (B) PCl_5
(C) $SOCl_2$ (D) All above

18. In the given reaction

$$R-\overset{\overset{\large O}{\|}}{C}-OH \xrightarrow{[X]} R-\overset{\overset{\large O}{\|}}{C}-Cl,$$

[X] will not be
(A) PCl_5 (B) $SOCl_2$
(C) HCl anhyd.$ZnCl_2$
(D) PCl_3

19. Carboxylic acids react with alcohols to form
(A) Aldehyde (B) Ketone
(C) Phenol (D) Ester

20. A reaction in which a carboxylic acid loses CO_2 is called
(A) Carbonylation
(B) Carboxylation
(C) Decarboxylation
(D) Amination

21. When carboxylate salts are heated with soda-lime, ———— are formed
(A) Alkenes (B) Alkanes
(C) Cycloalkanes (D) Alkynes

22. Decarboxylation of the silver salt of carboxylic acid in the presence of bromine to form alkyl bromide is called
(A) Birch reduction
(B) Wittig reaction
(C) Kolbe reaction
(D) Hunsdiecker raection

23. Which of the following reagents is used to convert carboxylic acid to alcohol?
(A) H_2/Ni (B) $LiAlH_4$
(C) $NaBH_4$ (D) Pt

24. When propanoic acid treated with aqueous sodium bicarbonate, carbon dioxide is liberated. The carbon of the carbon dioxide comes from
(A) Methyl group
(B) Carboxylic group
(C) Methylene group
(D) Bicarbonate

25. Which of the following will undergo decarboxylation on heating?
(A) Succinic acid (B) Phthalic acid
(C) Malonic acid (D) All

26. Reverse of esterification is known as
(A) Hydrolysis
(B) Transesterification
(C) Carboxylation
(D) Dehydration

27. Caboxylic acids react with alcohols in the presence of mineral acids to forms esters. This process is called
(A) Hydrolysis
(B) Transesterification
(C) Carboxylation (D) Esterification

28. The solution of which acid is used for seasoning of food
(A) Formic acid (B) Acetic acid
(C) Butanoic acid (D) Benzoic acid

29. The alkaline hydrolysis of an ester to form sodium salt of carboxylic acid and alcohol is called
(A) Hydrolysis (B) Saponification
(C) Carboxylstion (D) Dehydration

30. When the alkoxide group of one ester is replaced by another alkoxide group by refluxing ester with excess of alcohol in the presence of mineral acid, the process is called
(A) Hydrolysis
(B) Transesterification
(C) Carboxylation
(D) Dehydration

ANSWERS

1. C	2. D	3. A	4. A
5. D	6. D	7. D	8. B
9. C	10. B	11. D	12. C
13. D	14. B	15. C	16. C
17. D	18. C	19. D	20. C
21. B	22. D	23. B	24. D
25. C	26. A	27. D	28. B
29. B	30. B		

2.9. CHEMISTRY OF NITROGEN CONTAINING ORGANIC COMPOUNDS

1. Which of the following compounds contain nitrogen
(A) Amines
(B) Diazonium salts
(C) Proteins (D) All above

2. Reactions in which aldehydes and ketones can be converted to amines through catalytic reduction in the presence of ammonia or amine are called
(A) Amination (B) Oxidation
(C) Reduction
(D) Reductive elimination

3. Which of the following methods is used for the synthesis of primary amine?
(A) Kolbe reaction
(B) Gabrial synthesis
(C) Hofmann reaction
(D) None of the above

4. Reaction at 0°C between aniline, $NaNO_2$ and HCl is known as
(A) Nitration
(B) Sandmeyer's reaction
(C) Diazotisation (D) Halogenation

5. The decreasing order of the basic character of the amines and ammonia is
(A) $NH_3 > CH_3NH_2 > C_2H_5NH_2 > C_6H_5NH_2$
(B) $C_2H_5NH_2 > CH_3NH_2 > NH_3 > C_6H_5NH_2$
(C) $C_6H_5NH_2 > C_2H_5NH_2 > CH_3NH_2 > NH_3$
(D) $CH_3NH_2 > C_2H_5NH_2 > C_6H_5NH_2 > NH_3$

6. A compound with NaOH gives NH_3, it can be
(A) An acid amide
(B) An amine
(C) A nitro compound
(D) A substituted acid amide

7. α-Amino acetic acid with HNO_2 forms
(A) Oxalic acid (B) Acetic acid
(C) Glycolic acid (D) Nitroacetic acid

8. Which of the following forms a zwitter ion?
(A) $CH_3—CH(OH)—COOH$
(B) $H_2N—C_6H_4—COOH$
(C) $CH_3—CH(NH_2)—COOH$
(D) $CH_3—CH(NO_2)—COOH$

9. $CH_3CH_2—CH_2NH_2$ with chloroform and KOH (alc.) forms
(A) $CH_3CH_2CH_2CN$
(B) $CH_3CH_2CH_2NO_2$
(C) $CH_3CH_2CH_2NC$
(D) $CH_3CH_2CH_2—Cl$

10. An aromatic compound containing 'N' is insoluble in water and soluble in HCl; with $CHCl_3$ and KOH alc. Gives obnoxious smell, the compound is
(A) Nitrite (B) 1° amine
(C) 2° amine (D) 3° amine

11. Which of the following substances react with nitrous acid to give an alcohol?
(A) $C_2H_5NH_2$ (B) $(C_2H_5)_2NH$
(C) $C_6H_5NH_2$ (D) Both (A) and (C)

12. The following is a typical example of zwitter ion
(A) 4-amino benzoic acid
(B) 4-aminophenol
(C) Glycine (D) Acetamide

13. Ethylamine and aniline can be distinguished by
(A) Hinsberg's test
(B) Dye test
(C) Liebermann's nitrosoamine test
(D) Carbylamine test

14. Aniline on reaction with acetyl chloride gives A, which on reaction with Br_2-water followed by hydrolysis would give
(A) 2,4,6-tribromoaniline
(B) 2,4-dibromoaniline
(C) 2-bromoaniline and 4-bromoaniline
(D) 3-bromoaniline

15. Amines can be prepared by reduction of nitriles with hydrogen and ——— catalyst
(A) Ni (B) Pt
(C) $LiAlH_4$ (D) All above

16. Which of the following is stronger base?
(A) Ammonia (B) Methylamine
(C) Ethylamine
(D) Dimethylamine

17. The formula C_3H_9N may represent
(A) 1° and 2° amines
(B) 2° and 3° amines
(C) 1° amine only
(D) 1°, 2° and 3° amine

18. The compound which on reaction with HNO_2 at room temperature produces an oily compound is
(A) Methylamine (B) Ethylamine
(C) Triehtylamine (D) Diethylamine

19. Which of the following factors affect the basicity of amine?
(A) Solvent
(B) Resonance effect
(C) Effect of substituents
(D) All above

20. Which of the following factors decrease the basicity of aniline?
(A) $-NO_2$ (B) $-SO_3H$
(C) -COOH (D) All above

21. $C_6H_5NO_2 \longrightarrow C_6H_6$, the sequence of steps would be
(A) Reduction by sodium stannite
(B) Reduction by Raney Nickel
(C) Reduction by Sn — HCl diazotization followed by reaction with H_3PO_2
(D) Reduction by Sn — HCl, diazotization followed by reaction with HCl

22. Which of the following is not the Sandmeyer's reaction?
(A) $ArN_2^+X^- \xrightarrow{CuCl} ArCl + N_2$
(B) $ArN_2^+X^- \xrightarrow{CuBr} ArCl + N_2$
(C) $ArN_2^+X^- \xrightarrow{CuCN} ArCl + N_2$
(D) All above

23. Carbonyl compound + 'X' ⟶ Schiff's base; what is 'X'?
(A) 1° amine (B) 2° amine
(C) 3° amine (D) amide

24. Which of the following structures represents benzanilide?
(A) $C_6H_5NHCOCH_3$
(B) $C_6H_5NHCOC_6H_5$
(C) $CH_3NHCOC_6H_5$
(D) $CH_3NHCOCH_3$

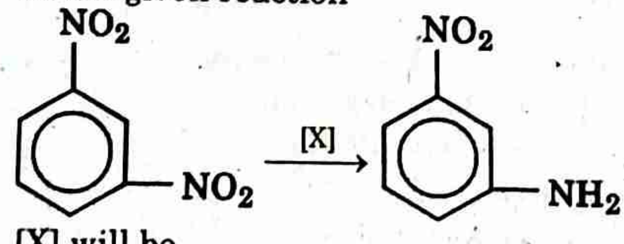
25. Triethylamine though expected to be more basic than diethylamine is actually less basic,; this is due to
(A) High volatility of 3° amine
(B) Decrease electron density at 'N'
(C) Less stabilization of the cation of the 3° amine than the cation of 2° amine
(D) Less solubility of 3° amines than 2° amines

26. $C_6H_5CONH_2 + HNO_2 \longrightarrow A + B$; the products are
(A) Phenol and ammonia
(B) Benzoic acid and ammonia
(C) Benzoic acid and nitrogen
(D) Phenol and nitrogen

27. Consider the following compounds
(i) p-methyl aniline
(ii) N,N-dimethyl aniline
(iii) N-ethyl aniline
(iv) N-ethyl-N-methyl aniline
The compounds which do not form diazonium salt with ice-cold $NaNO_2$ and HCl are
(A) (i), (ii) and (iii)
(B) (ii), (iii) and (iv)
(C) (i), (iii) and (iv)
(D) (ii) and (iv)

28. Gabriel's phthalimide method can be used for preparing which of the following
(i) 1° amines (ii) 2° amines
(iii) Cyanides (iv) Amino acids
(A) (i), (ii) and (iv)
(B) (i) and (iv) (C) (iii) and (iv)
(D) None of these

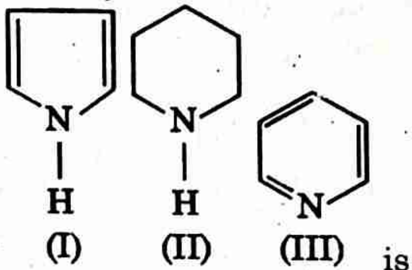
29. In the given reaction



[X] will be
(A) Na_2S/CH_3OH
(B) $H_2S/\overset{\ominus}{O}H$ (C) Zn/HCl
(D) $NaHSO_3/CH_3OH$

30. Aniline does not give coupling reaction at pH < 5 because
(A) Diazonium salt converts into $C_6H_5-N{=}N-Cl$ which cannot couple
(B) Aniline converts into $C_6H_5\overset{\oplus}{N}H_3\overset{\ominus}{Cl}$ which cannot couple
(C) Both (A) and (B)
(D) Coupling only takes place in basic medium

31. The correct order of increasing basicity of

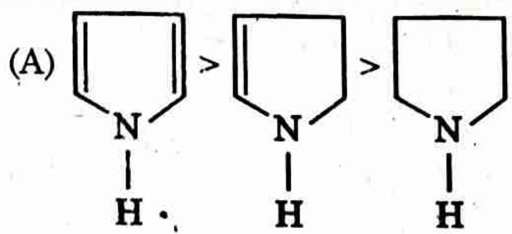


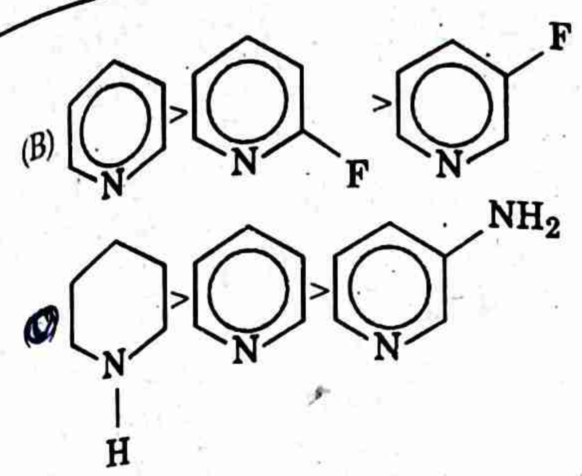
is
(A) I < II < III (B) I < III < II
(C) III < I < II (D) III < II < I

32. The base with lowest pK_a value is
(A) $N{\equiv}CCH_2NH_2$
(B) Et_3N (C) NH_3
(D) $HO-CH_2CH_2NH_2$

33. Carbylamine reaction proceeds via the intermediate formation of
(A) Alkyl isocyanide
(B) Chloride ion
(C) Alkyl carbanion
(D) Dichloro methylene

34. Which of the following basicity order is correct?
(A)





(D) RCH_2NH_2 > R—CN > RCH=NH

35. Which of the following compounds would you use in order to obtain a crystalline derivative of an aromatic amine?
(A) 2, 4-Dinitrophenyl hydrazine
(B) Nitrous acid
(C) Benzoyl chloride
(D) None of these

36. The reason why phenylamine is a much weaker base than ammonia when each is in aqueous solution is that
(A) The lone pair of electrons on two nitrogen atom of phenylamine is delocalised over the benzene ring
(B) The phenylamine molecule is too large to capture hydrogen ion easily
(C) Phenylamine is much less soluble in water than is ammonia
(D) The benzene ring has a tendency to increase the acidity of its substituent

37. A quaternary ammonium hydroxide on heating at above 100°C undergoes decomposition to give tertiary amine and alcohol is called
(A) Acylation
(B) Reductive elimination
(C) Exhaustive methylation
(D) Hofmann degradation

38. Which of the following amine is more basic in aqueous media?
(A) CH_3NH_2 (B) $(CH_3)_2NH$
(C) $(CH_3)_3N$ (D) $(CH_3)_4NBr$

39. Schiff's bases are produced by the reaction of aniline with
(A) Alcohols (B) Aldehydes
(C) Amides (D) Alkyl halides

40. Which of the following on reaction with chloroform and KOH produces carbylamine
(A) RNH_2 (B) R_2NH
(C) R_3N (D) All above

41. The most basic compound among following is
(A) Benzylamine (B) Aniline
(C) Acetanilide (D) *p*-Nitroaniline

42. Which of the following reagent can make distinction between primary and secondary amine?
(A) NH_3 (B) $NaNO_2/HCl$
(C) HCl (D) All the above

ANSWERS

1. A	2. D	3. B	4. C
5. B	6. A	7. C	8. C
9. C	10. C	11. A	12. C
13. B	14. C	15. D	16. D
17. D	18. D	19. D	20. D
21. C	22. D	23. A	24. B
25. C	26. C	27. B	28. B
29. A	30. B	31. B	32. B
33. D	34. C	35. C	36. A
37. D	38. B	39. B	40. A
41. A	42. B		

2.10. CHEMISTRY OF ALCOHOLS AND PHENOLS

1. How many alcohols are possible for C_4H_9OH?
   (A) 1 (B) 2
   (C) 3 (D) 4

2. An isomer of ethanol is
   (A) Methanol (B) Ethanal
   (C) Ethoxy ethane
   (D) Methoxy methane

3. n-Propyl alcohol and iso-propyl alcohol is an example of
   (A) Chain isomerism
   (B) Position isomerism
   (C) Metamerism (D) Tautomersim

4. Carbolic acid is
   (A) Phenol
   (B) Phenyl benzoate
   (C) Salol (D) Phenyl acetate

5. Which of the following is trihydric phenol?
   (A) Resorcinol (B) p-Cresol
   (C) Phloroglucinol (D) Catechol

6. Alcohols can be obtained from all methods except
   (A) Hydroboration-oxidation
   (B) Oxymercuration-demercuration
   (C) Reduction of carbonyl compounds with Zn-Hg/HCl
   (D) Fermentation of starch

7. Alkyl halides react with aqueous NaOH to form
   (A) Aldehydes (B) Ketones
   (C) Amines (D) Alcohols

8. The acid-catalyzed addition of water to an alkene produces
   (A) Aldehydes (B) Ketones
   (C) Amines (D) Alcohols

9. The increasing reactivity of CH_3OH, CH_3CH_2OH, $CH_3CH_2CH_2OH$ and $(CH_3)_2CHOH$ towards sodium metal is
   (A) $CHOH < CH_3CH_2OH < CH_3CH_2CH_2OH < (CH_3)_2CHOH$
   (B) $(CH_3)_2CHOH < CH_3CH_2OH < CH_3CH_2CH_2OH < CH_3OH$
   (C) $(CH_3)_2CHOH < CH_3CH_2CH_2OH < CH_3CH_2OH < CH_3OH$
   (D) $CH_3CH_2CH_2OH < (CH_3)_2CHOH < CH_3CH_2OH < CH_3OH$

10. Grignard reagent reacts with aldehydes and ketones to form
    (A) Aldehydes (B) Ketones
    (C) Amines (D) Alcohols

11. Reduction of aldehydes either by hydrogenation, or in the presence of metal catalyst such as Ni, Pt, or Pd gives
    (A) Amides
    (B) Carboxylic acid
    (C) Amines (D) Alcohols

12. Which of the following is a wood alcohol?
    (A) Metahnol (B) Ethanol
    (C) Propanol (D) None of above

13. Which of the following alcohol is produced from fermentation of sugars?
    (A) Metahnol (B) Ethanol
    (C) Propanol (D) None of above

14. The composition of rectified spirit is
    (A) 90 % Ethanol (B) 95 % Ethanol
    (C) 100 % Ethanol (D) None of above

15. Ethyl acetate reacts with Grignard reagent to form
(A) Tertiary alcohol
(B) Secondary alcohol
(C) Primary alcohol and acid
(D) Acid

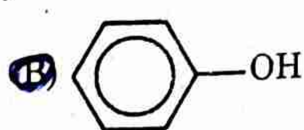
16. In which of the following group, each member gives a positive iodoform test?
(A) Methanol, ethanol, propanone
(B) Ethanol, isopropyl alcohol, methanol
(C) Ethanol, ethanal, isopropyl alcohol
(D) Propanal, 2-propanol, propanone

17. The reaction of formaldehyde and Grignard reagent followed by acidification gives
(A) Aldehyde (B) Ketone
(C) Carboxylic acid
(D) Primary alcohol

18. The enzyme that converts sucrose to glucose and fructose is called
(A) Zymase (B) Diastase
(C) Invertase (D) Maltase

19. The enzyme that converts starch to maltose is called
(A) Zymase (B) Diastase
(C) Invertase (D) Maltase

20. Which of the following alcohol is least soluble in water?
(A) Methanol (B) Ethanol
(C) n-Propyl alcohol
(D) n-Butyl alcohol

21. Which of the following compound has a lowest pK_a value?
(A) CF_3CH_2OH (B)


(C) $H-C\equiv C-H$
(D) CH_3—C₆H₄—OH

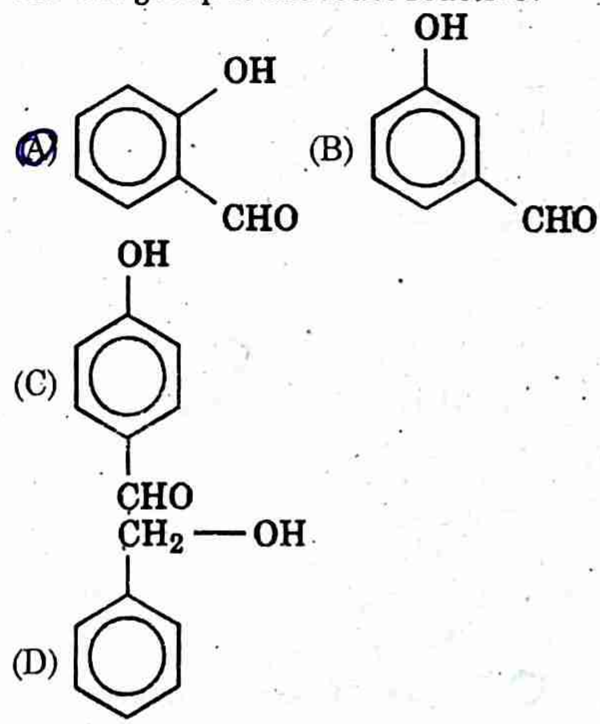
22. Which of the following compounds should be least soluble in water?
(A) Phenol (B) Ethanol
(C) Benzoic acid (D) Chlorobenzene

23. Identify the compound X

CH_3—C₆H₄—OH $\xrightarrow[\text{(ii) } CH_3Cl]{\text{(i) NaOH}}$ X

(A) CH_3—C₆H₄—OH
(B) C₆H₄(CHO)(OH) (ortho)
(C) CH_3—C₆H₄—Cl
(D) CH_3—C₆H₄—O—CH_3

24. In which of the following compound, the OH group is the least reactive?



25. Which of the following is most acidic?
(A) CH_3OH (B) C_2H_5OH
(C) C_3H_7OH (D) H_2O

26. Which of the following reagent cannot be used to detect the phenolic group?
(A) Neutral $FeCl_3$ (B) I_2/NaOH
(C) NaOH solution (D) Br_2/H_2O

27. An aromatic compound has a molecular formula C_7H_8O. How many isomers are possible for this compound?
(A) 3 (B) 4
(C) 5 (D) 6

28. Which of the following statements regarding phenols is not correct?
(A) Phenols are stronger acids than water and alcohols
(B) Phenols are weaker acids than carboxylic acids
(C) Phenols are soluble in both aqueous NaOH and aqueous sodium hydrogen carbonate
(D) Phenoxides ions are more stable than the corresponding phenols

29. Phenol on reaction with ethanoic anhydride in the presence of sodium ethanoate gives
(A) Phenyl benzoate
(B) Ethyl benzoate
(C) Phenyl ethanoate
(D) Phenyl methyl ether

30. Each of the following when present at para position decreases the acidic strength of phenol except
(A) $-NH_2$ (B) $-Cl$
(C) CH_3O- (D) CH_3-

31. Treatment of phenol with cold dilute nitric acid gives
(A) Only o-nitro phenol
(B) Only p-nitro phenol
(C) 2,4,6-Trinitro phenol
(D) Mixture of o-and p-nitro phenol

32. Which of the following is the strongest base?
(A) Ethoxide (B) Methoxide
(C) *Iso*-propoxide (D) *Ter*-butoxide

33. Which of the following is the strongest base?
(A) OH^- (B) OR^-
(C) CH_3^- (D) NH_2^-

34. The suitable reagent for dehydration of alcohol is
(A) PCl_5 (B) $CaCl_2$
(C) NaCl (D) Al_2O_3

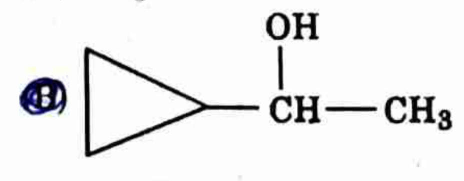
35. Best reagent for producing an alkyl chloride from an alcohol is
(A) PCl_5 (B) PCl_3
(C) $SOCl_2$ (D) HCl

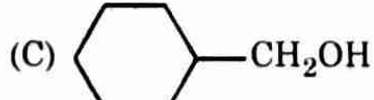
36. Which one of the following on oxidation gives ketone?
(A) Primary alcohol
(B) Secondary Alcohol
(C) Tertiary alcohol
(D) All above

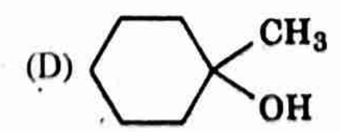
37. What is formed when a primary alcohol undergoes catalytic dehydrogenation?
(A) Aldehyde (B) Ketone
(C) Alkene (D) Acid

38. The order of reactivity of alcohols with sodium metal is
(A) 3°>2°>1° (B) 1°>2°>3°
(C) 2°>3°>1° (D) None of above

39. Which of the following alcohols will be oxidized by Br_2/KOH
(A) CH_3OH

(B) 

(C) 

(D) 

40. Phenol on heating with alc.KOH and chloroform undergoes
(A) Kolbe reaction
(B) Rosenmund reaction
(C) Reimer-Tiemann reaction
(D) Cannizzaro reaction

41. Which of the following compounds will be readily attacked by an electrophile?
(A) Chlorophenol (B) Benzene
(C) Phenol (D) Toluene

42. Which of the following compounds is formed by catalytic reduction of phenol?
(A) Benzene (B) Cyclohexanol
(C) Cyclohexane (D) Benzyl alcohol

43. Glycerol on dehydration gives
(A) Allyl alcohol (B) Acrolein
(C) CHOH $=$ C $=$ CHOH
(D) CHO — CHOH — CH_2OH

44. Phenol on treatment with Con. HNO_3 gives
(A) o-Nitrophenol (B) p-Nitrophenol
(C) o-and p-Nitrophenol
(D) 2, 4,6 Trinitrophenol

ANSWERS

1. B	2. D	3. B	4. A
5. C	6. C	7. D	8. D
9. C	10. D	11. D	12. A
13. B	14. B	15. A	16. C
17. D	18. C	19. B	20. D
21. B	22. D	23. D	24. A
25. D	26. B	27. C	28. C
29. C	30. B	31. D	32. D
33. C	34. D	35. C	36. B
37. B	38. B	39. B	40. C
41. C	42. Bs	43. B	44. D

2.11. POLYMERS

1. Which one of the following is natural polymer?
(A) Starch (B) Nylon-66
(C) Polyester (D) Buna-S, SBR

2. Which of the following is not a biodegradable polymer?
(A) Protein (B) Nucleic acid
(C) PVC (D) Cellulose

3. Monomer of Nylon-6 is
(A) Adipic acid
(B) Hexamethylenediamine
(C) Caprolactam (D) All of these

4. Which of the following is homopolymer?
(A) Starch (B) Plexiglas
(C) Orlon (D) All of these

5. Which type of polymer the Nylon-66 is?
(A) Polyamide (B) Polyester
(C) Addition (D) Homopolymer

6. Which of the following statements are correct for linear polymers?
(A) Linear polymers may be condensation as well as addition polymers
(B) Structure is well packed in nature
(C) Linear polymers have higher density, higher melting point and higher tensile strength
(D) All are correct

7. Which of the following is linear polymer?
(A) Polypeptide (B) Protein
(C) Starch
(D) Phenol-formaldehyde resin

8. Which type of polymers the Vulcanised rubbers is?
(A) Linear (B) Cross-linked
(C) Branch-chain
(D) Any one of these

9. Which of the following is branch-chain polymer?
(A) Glycogen (B) Terylene
(C) PVC (D) Orlon

10. Polyamide linkage is present in
(A) Nylon (B) Silk
(C) Protein (D) All of these

11. Which of the following compounds cannot be a monomer?
(A) $CH_3 - CHOH - CH_2OH$
(B) $NH_2 - CH_2 - NH_2$
(C) $CH_3 - CH_2 - NH_2$
(D) $NH_2 - CH_2 - CH(CH_3) - CH_2 - NH_2$

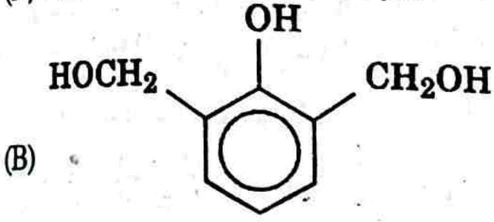
12. Which monomer will give cross linked polymer?
(A) $HOOC - C_6H_4 - COOH$
(B) $NH_2 - CH_2 - COOH$
(C)
HOH_2CHN N $NH - CH_2OH$
N N
$NH - CH_2OH$
(D) $CH_2OH - CH_2OH$

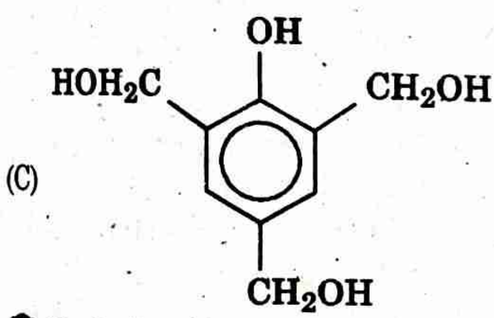
13. Polymer obtained by the given compound is

$$(HOH_2C)_2N-\overset{O}{\overset{\|}{C}}-N(CH_2OH)_2$$

(A) Urea-formaldehyde resin
(B) Phenol-formaldehyde resin
(C) Alkyd resin
(D) Melamine-formaldehyde resin

14. Monomer/s of phenol-formaldehyde resin is/are
(A) Phenol and formaldehyde

(B) 

(C) 

(D) Both (A) and (C)

15. Which one of the following compound can be monomer of rubber?
(A) $CH_2=CH_2$ (B) $CH_2=CHCl$
(C) $CH_2=C(CH_3)-\overset{O}{\overset{\|}{C}}-OCH_3$
(D) $CH_2=C(CH_3)-CH=CH_2$

16. In propagation step the reaction intermediate of radical polymerization is
(A) Carbocation (B) Carbanion
(C) Free radical (D) Carbene

17. Which monomer will give radical polymerisation most readily?
(A) $CH_2=CH_2$
(B) $C_6H_5-CH=CH_2$
(C) $CH_3-CH=CH_3$
(D) $CH_3-C(CH_3)=CH_2$

18. Which of the following monomers can undergoes radical, cationic as well as anionic polymerisation with equal ease?
(A) $CH_3-C(CH_3)=CH_2$
(B) $C_6H_5-CH=CH_2$
(C) $CH_2=CH-CN$
(D) $CH_2=CH_2$

19. In which polymerization branching of chain cannot be possible?
(A) Free radical (B) Cationic
(C) Anionic
(D) Anionic and Ziegler-Natta

20. Cationic polymerization is initiated by
(A) BF_3 (B) $NaNH_2$
(C) BuLi
(D) Both (B) and (C)

21. Which of the following monomers will give cationic polymerization?
(A) $CH_2=CH-Cl$
(B) $CH_2=CH-CN$
(C) $CH_2=CH-\overset{O}{\overset{\|}{C}}-OCH_3$
(D) $CH_3-C(CH_3)=CH_2$

22. Which of the following type of polymerisation is used for the preparation of synthetic rubber?
(A) Free radical (B) Ziegler-Natta
(C) Cationic (D) Anionic

23. Ziegler-Natta catalysts is
(A) $(C_2H_5)_3Al$ (B) $TiCl_4$
(C) $(C_2H_5)_3Al/TiCl_4$
(D) $(C_2H_5)_3B/TiCl_2$

24. High density polyethylene has which type of structure
(A) Linear (B) Branch-chain
(C) Cross-linked
(D) Any one of these

25. In which polymer the strength of intermolecular forces is maximum
(A) Elastomers (B) Thermoplastic
(C) Fibre
(D) Cross-linked polymer

26. Monomer of natural rubber is
(A) 1,3-Butadiene
(B) 2-Methyl-1,3-butadiene
(C) 1,2-Butadiene
(D) 1,3-Pentadiene

27. Gutta-percha is
(A) *Cis*-poly isoprene
(B) *Trans*-polyisoprene
(C) Polyethylene
(D) Polyisobutylene

28. In order to give strength and elasticity, natural rubber is heated with
(A) Sulphur (B) Oxygen
(C) Nitrogen (D) Chlorine

29. Monomer of Teflon is
(A) Monochloroethene
(B) 1,2-Difluoroethene
(C) 1,1,2-Trifluoroethene
(D) Tetrafluoroethene

30. Monomer of neoprene rubber is
(A) 1-chloro-1,3-butadiene
(B) 2-chloro-1,3-butadiene
(C) 2-Bromo-1,3-butadiene
(D) 2-Methyl-1,3-butadiene

31. Glyptal is a copolymer of
(A) Terephthalic acid and glycol
(B) Terephthalic acid and glycerol
(C) Phthalic acid and glycol
(D) Phthalic acid and glycerol

32. Which one of the following is used to make non-stick material?
(A) Vinyl cyanide
(B) Tetrafluoroethene
(C) Vinyl chloride (D) Styrene

33. Orlon is polymer of
(A) Styrene (B) $CF_2=CF_2$
(C) Vinyl chloride (D) Acrylonitrile

34. Which of the following contains isoprene units?
(A) Natural rubber (B) Nylong-6,6
(C) Polyethylene (D) Dacron

35. Which is not true about polymers?
(A) Polymers do not carry any charge
(B) Polymers have high viscosity
(C) Polymers scatter light
(D) Polymers have low molecular weight

36. What type of intermolecular force present in nylon-66?
(A) Van der Waal (B) Hydrogen bond
(C) Dipole-dipole interactions
(D) Sulphide linkage

37. Soft drinks and baby feeding bottles are generally made up
(A) Polyester (B) Polyurethane
(C) Polyamide (D) Polystyrene

38. Which of the following polymers is/are chlorinated?
(A) Orlon (B) Neoprene
(C) Dacron (D) None of these

39. SAN is a polymer of
(A) Styrene (B) Acrylonitrile
(C) Both (A) and (B)
(D) Vinyl chloride

40. Which of the following is strong adhesive?
(A) Epoxy resin
(B) Melamine-formadehyde resin
(C) Alkyd resins (D) Bakelite

41. Which of the following is thermoplastic?
(A) Dcaron (B) Nylon
(C) Polythene (D) All of above

42. The process of vulcanization of rubber makes it
(A) Hard (B) Soft
(C) Less elastic (D) None of above

43. Bakelite is an example of
(A) Elastomer (B) Fibre
(C) Thermoplastic
(D) Thermosetting polymer

44. Dacron is an example of
(A) Elastomer (B) Fibre
(C) Thermoplastic
(D) Thermosetting polymer

45. The monomer of natural rubber is
(A) Butadiene (B) Isoprene
(C) Chloroprene (D) None of above

ANSWERS

1. A	2. C	3. C	4. D
5. A	6. D	7. A	8. C
9. A	10. D	11. C	12. C
13. A	14. D	15. D	16. C
17. B	18. B	19. D	20. A
21. D	22. B	23. C	24. A
25. D	26. B	27. B	28. A
29. D	30. B	31. C	32. B
33. D	34. A	35. D	36. B
37. D	38. B	39. C	40. A
41. D	42. A	43. D	44. B
45. B			

2.12. ORGANIC ACIDS AND BASES

1. Which of the following statements is not correct in respect of Arrhenius concept?
   (A) This concept is applicable only for aqueous systems
   (B) Neutralization takes place in aqueous medium only
   (C) H^+ ion cannot remain as such in water
   (D) This concept is applicable for non-aqueous systems only

2. Which of the following statements is not correct with the concept of Bronsted concept of acids and bases?
   (A) An acid can donate a proton
   (B) A base can accept a proton
   (C) This concept has many bases that have OH^- ions
   (D) This concept is more general

3. Which of the following pairs does not represent Lowery acid-base pair?
   (A) $H_2O + NH_3$ (B) $H_2O + H_2O$
   (C) $HCl + H_2O$ (D) $CH_3NH_2 + BF_3$

4. Which of the following does not represent Lewis acid?
   (A) $ZnCl_2$ (B) $FeCl_3$
   (C) BF_3 (D) BuLi

5. Which of the following does not represent Lewis base?
   (A) Pyridine (B) $NaNH_2$
   (C) NaOH (D) PCl_3

6. Which of the following statements do not represent Lewis idea of acids and bases?
   (A) Compounds which have completely filled orbitals
   (B) Compounds which have incompletely filled orbitals
   (C) Compounds in which the central atom can expand its octet
   (D) All simple metal ions like Ag^+, Al^{3+} etc.

7. Inorganic acids (HCl, HBr, HNO_3 etc.) have K_a value
   (A) <1 (B) >1
   (C) >10 (D) <10

8. Weak acids have K_a value
   (A) $>10^{-4}$ (B) $<10^{-4}$
   (C) $>10^{-5}$ (D) $<10^{-5}$

9. Which of the following acids have high pK_a value?
   (A) H_2O (B) CH_3COOH
   (C) $ClCH_2COOH$ (D) FCH_2COOH

10. Which of the following bases have high pK_a value?
    (A) Methylamine (B) Ammonia
    (C) Pyridine (D) Pyrrole

11. It has been observed that all the strong acids show same strength in the aqueous medium. This is called
    (A) Asymmetric effect
    (B) Stark effect
    (C) Levelling effect
    (D) Salt effect

12. Which of the following factors affect the strength of an acid?
    (A) Strength of the H — A bond
    (B) Electronegativity of A
    (C) The nature of the solvent
    (D) All above

13. H_2S is stronger acid than H_2O due to the reason that
(A) H_2S is a gas while H_2O is liquid
(B) S — H bond is stronger
(C) S — H bond is weaker than O—H bond
(D) H_2S forms H — bonding

14. Which of the following factors affect the strengths of acids and bases?
(A) Inductive effect
(B) Resonance effect
(C) Hydrogen effect
(D) All above

15. The polarization in one bond caused by the polarization of an adjacent bond is called
(A) Resonance effect
(B) Inductive effect
(C) Mesomeric effect
(D) Salt effect

16. Which of the following groups exert –I effect?
(A) — NO_2 (B) — CN
(C) — COOH (D) All above

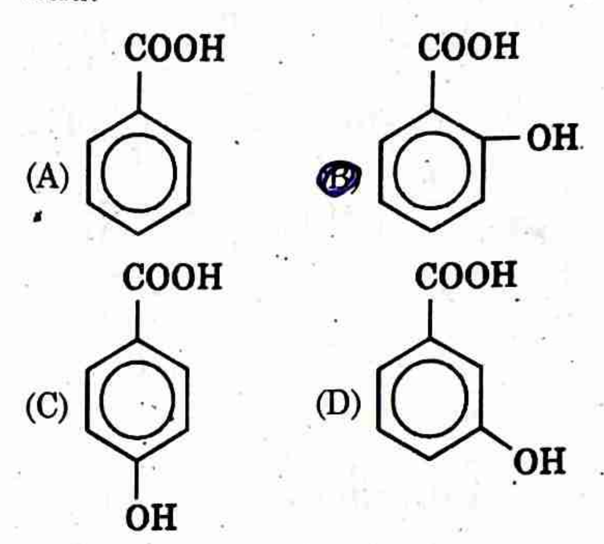
17. Which of the following groups does not exert +I effect?
(A) S_iR_3 (B) — COO^-
(C) — CH_2Me (D) >C=0

18. The effect that operates not through bonds, but directly through space is called?
(A) Field effect
(B) Resonance effect
(C) Asymmetric effect
(D) Inductive effect

19. Which of the following is correct order of amine strength in gas phase?
(A) $CH_3NH_2 > NH_3 > (CH_3)_3N > (CH_3)_2N$
(B) $NH_3 < CH_3NH_2 < (CH_3)_2NH < (CH_3)_3N$
(C) $(CH_3)_3N < (CH_3)_2NH > CH_3NH_2 > NH_3$
(D) $(CH_3)_2NH < (CH_3)_3N < NH_3 > CH_3NH_2$

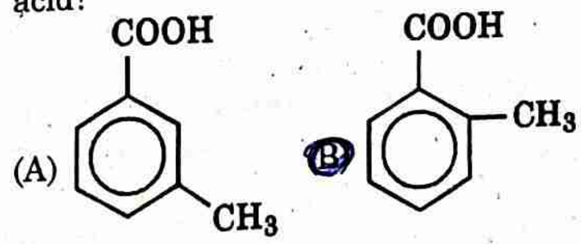
20. Which of the following haloacids is stronger acid?
(A) FCH_2COOH (B) $ClCH_2COOH$
(C) $BrCH_2COOH$ (D) ICH_2COOH

21. Which of the following acids is weaker acid?



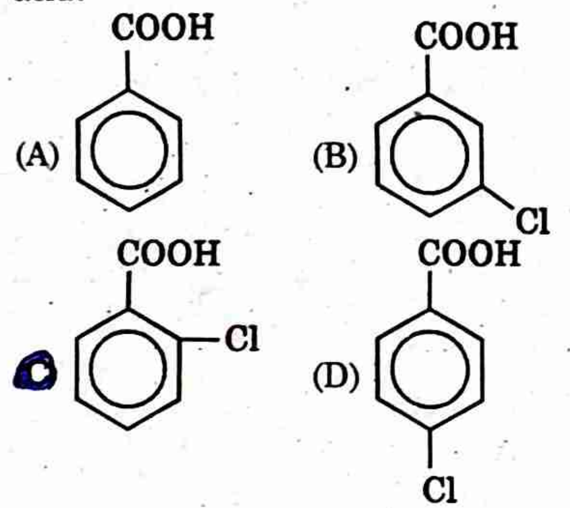
22. In solutions, the acidity of simple alcohols is in the order?
(A) $CH_3OH > CH_3CH_2OH > (CH_3)_3COH > (CH_3)_2CHOH$
(B) $CH_3OH > CH_3CH_2OH > (CH_3)_2CHOH > (CH_3)_3COH$
(C) $CH_3CH_2OH > CH_3OH > (CH_3)_3COH > (CH_3)_2CHOH$
(D) $(CH_3)_3COH > (CH_3)_2CHOH > CH_3CH_2OH > CH_3OH$

23. Which of the following is a stronger acid?



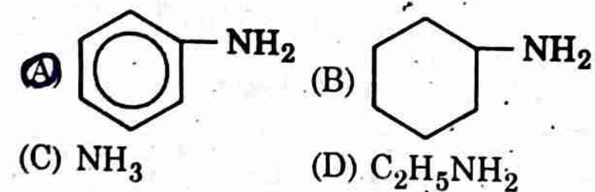
(C) COOH / CH_3 (D) COOH

24. Which of the following is a stronger acid?



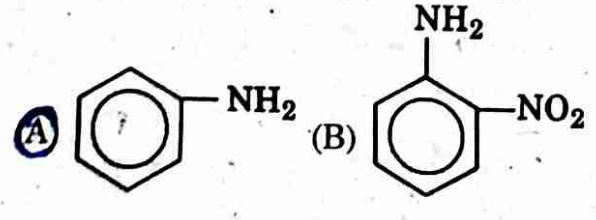
25. In aqueous medium, the order of amine strength is
(A) $(CH_3)_2NH > CH_3NH > NH_3 > (CH_3)_3N$
(B) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N > NH_3$
(C) $NH_3 > CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$
(D) $CH_3NH_2 > (CH_3)_2NH > NH_3 > (CH_3)_3N$

26. Which of the following amines is less basic?



(C) NH_3 (D) $C_2H_5NH_2$

27. Which of the following is more basic?



(C) NH_2, NO_2

(D) NH_2, O_2N

28. The equation which relates the reaction rates and equilibrium constants of many reactions is known as
(A) Taft equation
(B) Hammett equation
(C) Differential equation
(D) Linear equation

29. Which of the following statements is not correct with respect to applications of Hammett equations?
(A) It develops a quantitative relationship between structure and reactivity
(B) This equation can be used to calculate the value of pK_a
(C) It classifies the substitutes into two categories
(D) This equation has mechanistic implications
(E) This equation does not help to calculate the rate of some reactions

30. Which of the following statement is not correct with respect to limitations of Hammett equation?
(A) It is only applicable to aromatic systems
(B) Only applicable to aliphatic systems
(C) It is not valid for m-substituent
(D) It is not valid for p-substituent

31. Which of the following equations represent linear free energy relationship?
(A) Hammett equation

(B) Taft equation
(C) Helmholtz equation
(D) Differential equation

32. Which of the following is a nucleophile?
(A) $AlCl_3$ (B) H_3O^+
(C) BF_3 (D) CN^-

33. Which of the following is not a nucleophile?
(A) CN^- (B) BF_3
(C) CH_3O^- (D) NH_3

34. Which of the following is not a resonable (strong) nucleophile?
(A) OH^- (B) NH_3
(C) CN^- (D) H_2O

35. Higher basiscity of pyridine than pyrrole is justified by
(A) Hybridization of nitrogen
(B) Huckle rule
(C) Electron donating effect on amino group
(D) Both a and b

36. The distinguish among primary, secondary and tertiary alcohols, one would use the following experimental method.
(A) Sandmeyer reaction\
(B) Witting reaction
(C) Ninhydrin test
(D) Lucas test

37. Compounds that has more than one electron pair on different atoms and may donate to carbon in substrate called.
(A) Nucleophile
(B) Aembidnt nucleophile
(C) Ligand
(D) None of the above

38. *Tert*-butyl cation is stabilized through which phenomenon.
(A) Hyperconjugation
(B) Resonance effect
(C) Conjugation effect
(D) Mesomeric effect

39. Which of the following sets consists of 'only polar aprotic solvents?
(A) Water, hexane, methanol
(B) Acetic acid, DMF, toluene
(C) DMSO, ethanol, acetonitrile
(D) DMF, acetonitrile, DMSO

40. Maleic acid is stronger than fumeric acid due to
(A) Intramolecular Hydrogen Bonding
(B) Electron withdrawing effect of —COOH.
(C) Electron donating effect of —COOH.
(D) All of the above

ANSWERS

1. D	2. C	3. C	4. D
5. D	6. A	7. A	8. B
9. A	10. A	11. C	12. D
13. C	14. D	15. B	16. D
17. D	18. A	19. B	20. A
21. B	22. B	23. B	24. C
25. B	26. A	27. A	28. B
29. E	30. B	31. B	32. D
33. B	34. D	35. D	36. D
37. B	38. A	39. D	40. A

2.13. CHEMISTRY OF ACTIVE METHYLENE COMPOUNDS

1. A reactive methylene group is a methylene group present between
   (A) Carbonyl groups
   (B) Electron donating groups
   (C) Hydroxyl groups
   (D) Amino groups

2. Which of the following is not a reactive methylene compound?
   (A) $CH_3CO\ CH_2COOC_2H_5$
   (B) $C_2H_5OOCCH_2CH_2NH_2$
   (C) $C_2H_5OOCCH_2COOC_2H5$
   (D) $C_2H_5OOC\ CH_2CH_2CN$

3. The compound which exhibits keto-enol tautomerism is
   (A) $C_2H_5OOCCH_2CN$
   (B) $C_2H_5O\ OCCH_2NO_2$
   (C) $C_2H_5O\ OC\ CH_2COCH_3$
   (D) $C_2H_5O\ OC\ CH_2CN$

4. The reaction used for the preparation of ethyl acetoacetate starting from ethyl acetate is known as
   (A) Cannizzaro reaction
   (B) Clasien-Schmidt reaction
   (C) Michael condensation
   (D) Claisen condensation

5. Which of the following is not a reaction of enolic form of acetoacetic ester?
   (A) Colouration with $FeCl_3$
   (B) Addition of bromine
   (C) Reaction with HCN
   (D) Acetylation

6. Ethyl acetoacetate when boiled with aqueous KOH undergoes hydrolysis to form mainly
   (A) $CH_3\ CO\ CH_3$ (B) CH_3COOH
   (C) $CH_3COCH_2\ COOH$
   (D) $CH_3COCOOH$

7. Reaction of ethyl acetoacetate with phenyl hydrazine forms
   (A) Methyl isoxazolone
   (B) 3-Methyl-1-phenylpyrazolone
   (C) Methyl isoxapyrazolone
   (D) Dimethyl phenyl oxazolone

8. The enolic form of acetonacetic ester as compared to ketonic form contains
   (A) One extra double bond
   (B) One extra lone pair
   (C) One less double bond
   (D) Both have same number of σ, π bonds and lone pairs

9. Keto-enol tautomerism arises due to
   (A) Migration of a proton
   (B) Migration of a keto group
   (C) Migration of enolic group
   (D) Migration of hydroxyl group

10. Tautomers must have the following
    (A) Same functional group
    (B) Dynamic equilibrium between functional isomers
    (C) Same position of double bond
    (D) Static equilibrium between functional isomers

11. The correct order of enolic contents of $CH_3COCH_2COOC_2H_5$(I), $CH_3COCH_2COCH_3$(II) and CH_3COCH_2CHO(III) is
(A) I > II > III (B) II > III > I
(C) III > II > I (D) I > III > II

12. Ethyl acetoacetate may be used to prepare
(A) Carboxylic acids (B) Ketones
(C) Ketonic acids (D) All of these

13. Reaction of sodium ethoxide with malonic ester forms a
(A) Resonance stabilized anion
(B) Resonance stabilized cation
(C) Resonance stabilised free radical
(D) Resonance stabilised electrophile

14. Malonic ester can be used to prepare
(A) Carboxylic acids
(B) Keto acids
(C) Amino acids (D) All of these

15. The order of percentage enolic character of malonic ester (I), acetoacetic ester (II) and cyanoacetic ester (III) is
(A) I > II > III (B) III > II > I
(C) II > I > II (D) II > III > I

16. For the preparation of various monocarboxylic acids malonic ester before hydrolysis is treated with
(A) Na/C_2H_5OH (B) $NaOC_2H_5$
(C) $NaOC_2H_5$ (D) RX

17. Succinic acid may be obtained from sodiumalonic ester by its reaction with —— followed by hydrolysis
(A) R—X (B) I_2
(C) Alc.KOH (D) Dil.HCl

18. Malonic ester reacts with urea in presence of $POCl_3$ to form
(A) Barbituric acid
(B) Parabamic acid
(C) Veronal (D) Luminal

19. In its synthetic applications cyanoacetic ester closely resembles
(A) Ethyl acetoacetate
(B) Acetoacetic ester
(C) Malonic ester
(D) Nitroacetic ester

20. The compound with which cyanoacetic ester can react but malonic ester cannot is
(A) Acetaldehyde (B) Acetone
(C) Acid halide (D) Alkyl halide

21. When a secondary amine reacts with a carbonyl compound having α-hydrogen the product is
(A) Enamine (B) Imine
(C) Tertiary amine
(D) Quaternary salt

22. Which of the following is not a tautomeric pair?
(A) $-\overset{|}{C}=\overset{|}{C}-\overset{H}{\overset{|}{N}}-R$ and $-\underset{H}{\underset{|}{\overset{|}{C}}}-\overset{|}{C}=N-R$
(B) $-\overset{O}{\overset{\|}{C}}-\overset{H}{\overset{|}{C}H}-$ and $-\overset{O-H}{\overset{|}{C}}=CH-$
(C) $-\overset{H}{\overset{|}{C}}=\overset{|}{C}-\overset{R}{\overset{|}{N}}-R$ and $-\overset{R}{\overset{|}{C}}=\overset{|}{C}-\overset{H}{\overset{|}{N}}-R$
(D) $H-C\equiv N$ and $C\leftrightarrows N-H$

ANSWERS

1. A	2. B	3. C	4. D
5. C	6. A	7. B	8. D
9. A	10. B	11. B	12. D
13. A	14. D	15. D	16. C
17. B	18. A	19. C	20. B
21. A	22. C		

2.14. REACTION MECHANISM

1. Homolytic fission of covalent bond results in the formation of
(A) Free radicals (B) Carbocations
(C) Carbanions
(D) Both (B) and (C)

2. Which of the following bond is likely to break by homolysis?
(A) C — Cl (B) C — H
(C) H — Cl (D) H — O

3. Heterolysis of a 'C — C' covalent bond forms?
(A) Free radicals
(B) Carbocations only
(C) Carbanions only
(D) Both carbocations and carbanions

4. A reaction in which bond breaking and making processes take place simultaneously is called
(A) Free radical reaction
(B) No mechanism reaction
(C) Synchronous reaction
(D) Multistep reaction

5. Free radicals are characterized by
(A) Paramagnetism
(B) Diamagnetism
(C) Loss of electrons
(D) Low reactivity

6. Which of the following is true about carbanions?
(A) It has tetrahedral shape
(B) Carbanion carbon is sp^3 hybridised
(C) It has trigonal shape
(D) Their order of stability is Pr. < Sec. < Ter.

7. The order of stability of free radicals
[I] $CH_2{=}CH{-}\dot{C}H_2$, [II] $CH_3\dot{C}H_2$,
[III] $(CH_3)_2\dot{C}H$ and [IV] $CH_3)_3\dot{C}$ is
(A) I < II < III < IV
(B) IV < III < II < I
(C) II < III < IV < I
(D) II < I < III < IV

8. Which of the carbocation is likely to be most stable?
(A) $CH_3{\cdot}\overset{\oplus}{C}H_2$ (B) $(CH_3)_2\overset{\oplus}{C}H$
(C) $(CH_3)_3\overset{\oplus}{C}$
(D) $CH_2{=}CH{-}\overset{\oplus}{C}H_2$

9. A reaction intermediate having only six electrons in the outer orbit of carbon but no charge on it, is known as
(A) Carbene (B) Carbocation
(C) Carbanion (D) Free radical

10. Identify an electrophile
(A) SO_2 (B) SO_3
(C) NF_3 (D) $H_3\overset{\oplus}{O}$

11. Heterolysis of which bond is likely to form carbanion
(A) C — Cl (B) C — O
(C) C — Mg (D) C — N

12. Entropy is a measure of
(A) Heat content (B) Free energy
(C) Enthalpy (D) Randomness

13. According to transition state theory which of the following is not the necessary requirement for reaction to occur
(A) Energy of activation
(B) Transition state
(C) Collision (D) None of above

14. According to collision theory, reaction takes place when molecules are
(A) Activated
(B) In proper orientation
(C) Colliding (D) All of these

15. Mechanism of reaction may be studied with the help of
(A) Intermediate trapping
(B) Isotopic labeling
(C) Stereochemical evidence
(D) All of these

16. Dehydration of alcohol in acidic conditions is an example of which type of reaction
(A) E_1 (B) E_2
(C) S_N2 (D) S_N1

17. The type of reaction exhibited by alkanes is
(A) Free radical substitution
(B) Electrophilic substitution
(C) Nucloephilic substitution
(D) Depends on type of reagent

18. Amongst the following which will show anti-Markownikoff addition in the absence of peroxides
(A) $CH_2=CH-CH_3$
(B) $CH_2=CH-CF_3$
(C) $CH_2=CH-Cl$
(D) None of these

19. In the dehydrohalogenation of 2-chlorobutane the main product is
(A) 2-Butanol (B) 2-Butene
(C) 1-Butene (D) 1-Butanol

20. Carbene intermediate is involved in which reaction
(A) Reimer-Tiemann
(B) Carbylamine reaction
(C) Both (D) None

21. Cannizzaro reaction involves migration of which species
(A) Proton (B) Carbene
(C) Hydride ion (D) Carbanion

22. The reaction of benzene ring are mainly
(A) Free radical substitution
(B) Electrophonic substitution
(C) Nucleophilic substitution
(D) Nucleophilic addition

23. The reactions of carbonyl group are
(A) Free radical addition
(B) Electrophilic additions
(C) Nucleophilic addition
(D) Nucloephilic substitutions

24. The change in the state of hybridization of carbon in the reaction $R-CN \rightarrow RCONH_2$ is
(A) sp^3 to sp^2 (B) sp^2 to sp
(C) sp to sp^3 (D) sp to sp^2

25. The reactions of $>C=C<$ are mainly
(A) Electrophilic addition
(B) Electrophilic substitution
(C) Nucleophilic addition
(D) Nucleophilic substitution

26. Diels-Alder reaction is an example of which type of reaction
(A) Electrophilic addition
(B) Nucleophilic addition
(C) Pericyclic reaction
(D) Sigmatropic reaction

27. In the thermal conversion of cyclobutene to butadiene, the reaction is symmetry allowed if there is
(A) Conrotatory opening of the ring
(B) Disrotatory opening of ring
(C) No correlation of symmetry
(D) Reaction does not occur

28. An example of sigmatropic rearrangement is
(A) Diels-Alder reaction
(B) Claisen rearrangement
(C) Hofmann bromamide reaction
(D) Benzidine rearrangement

29. Formation of polyamide 'Nylon' from adipic acid and hexamethylene diamine is an example of
(A) Condensation reaction
(B) Addition polymerisation
(C) Condensation polymerization
(D) Copolymerisation

30. Which of the following reactions are not shown by benzaldehyde?
(A) Benzoin condensation
(B) Perkin reaction
(C) Cannizzaro reaction
(D) Beckmann rearrangement

31. SN2 reactions are
(A) Bimolecular (B) Unimolecular
(C) Usually occur through unimolecular
(D) None of these

32. Kinetics of SN2 reactions are usually
(A) Second order (B) First order
(C) Pseudo-second order
(D) None of these

33. The SN2 mechanism occurs in
(A) One step (B) Two step
(C) Depends upon nucleophile
(D) None of these

34. Which of the following statements regarding the SN1 mechanism is wrong?
(A) SN1 reactions are unimolecular
(B) SN1 reactions are first order
(C) The SN1 mechanism involves a single step
(D) SN1 reactions usually occur in two steps

35. Which is the most reactive compound by the SN2 mechanism?
(A) $CH_3CH_2CH_2CH2Br$
(B) $(CH_3)_2CHCH2Br$
(C) Both A & B are equally reactive
(D) None of these can undergo SN2

36. Which is the most reactive compound by the SN1 mechanism?
(A) $CH_2{=}CHCH_2Br$
(B) $CH_3CH_2CH_2Br$
(C) Both A & B are equally reactive
(D) None of these can undergo SN1

37. Which of the following statements is wrong?
(A) SN1 reactions undergo partial inversion of configuration
(B) SN2 reactions undergo partial inversion of configuration
(C) Both a & b
(D) None of the above

38. Which of the following is most reactive as a nucleophile?
(A) PhO- (B) CH_3O-
(C) CH_3CH_2O- (D) CH_3NH_2

39. Which of the following statements regarding the E_1 mechanism is wrong?
(A) Reactions by the E1 mechanism are unimolecular in the rate-determining step
(B) Reactions by the E1 mechanism are generally first order
(C) Reactions by the E1 mechanism usually occur in two step
(D) Reactions by the E1 mechanism are multi-step reactions

40. In most of the cases compete with S_N2 reactions.
(A) E1 Reactions Reactions
(B) E2 Reactions (C) Both A and B
(D) None of these

41. Which of the following statements regarding the E2 mechanism is wrong?
(A) Reactions by the E2 mechanism are always bimolecular
(B) Reactions by the E2 mechanism are generally second order
(C) Reactions by the E2 mechanism usually occur in one step
(D) Reactions by the E2 mechanism usually occur in two steps

42. Which of the following statements regarding mechanisms of elimination reaction is wrong?
(A) The E1 mechanism does not require a base
(B) The E2 mechanism generally occurs under highly basic conditions
(C) The E2 mechanism is stereospecific
(D) The E1 mechanism is usually unimolecular in the rate-determining step but leads to a second order rate law

43. 71. Bromobenzene can"t undergo S_N2 reaction because.
(A) Br has poor electron withdrawing effect
(B) Phenyl groups is inductively electron donating
(C) The E2 mechanism is stereospecific
(D) Nucleophile is repelled by when it attacks on backside of SP^2 carbon

44. In elimination reactions bulky leaving groups prefers to give
(A) Hoffmann product
(B) Saytzeff product
(C) Sometimes Saytzeff and sometimes Hoffmann product
(D) None of these

45. In Saytzeff product a base/nucleophile attacks the substrate
(A) Small sized (B) Large sized
(C) Small or large sized (size of base no matters)
(D) None of these

46. In elimination reactions, poor leaving group prefers to follow
(A) E2 mechanism (B) E1 mechanism
(C) Both a & b are equally prferable
(D) None of these

47. Which type of solvent requires for the reactions to perform S_N2 mechanism.
(A) Polar protic (B) Non-polar
(C) Polar aprotic D) Aqueous

ANSWERS

1. A	2. B	3. D	4. C
5. A	6. B	7. C	8. D
9. A	10. B	11. C	12. D
13. C	14. D	15. D	16. A
17. A	18. B	19. B	20. C
21. C	22. B	23. C	24. D
25. A	26. C	27. A	28. B
29. C	30. D	31. A	32. A
33. A	34. C	35. A	36. A
37. B	38. C	39. D	40. B
41. D	42. D	43. D	44. A
45. A	46. A	47. A	

2.15. ORGANIC SPECTROSCOPY

1. The relation between wave number ($\bar{v}$) and wavelength is given by the expression (where c is the wavelength of light)

   (A) $\bar{v} = \frac{1}{\lambda}$ (B) $\bar{v} = \frac{c}{\lambda}$

   (C) $\bar{v} = \frac{1}{\lambda^2}$ (D) $\bar{v} = \lambda/c$

2. Vacuum ultraviolet region is

   (A) 400 – 800 nm (B) 200 – 400 nm

   (C) 100 – 200 nm (D) 100 – 400 nm

3. Absorption of ultraviolet radiations by a molecule causes

   (A) Electronic excitation

   (B) Vibrational excitation

   (C) Rotational excitation

   (D) All of these

4. Which of the following group is a chromophore?

   (A) $—NH_2$ (B) —OH

   (C) $>C=C<$ (D) None of these

5. Which of the following is not an auxochrome group?

   (A) $—NO_2$ (B) $—NH_2$

   (C) $—NR_2$ (D) —NHR

6. Bathochromic shift is shifting of absorption to

   (A) Higher wave number

   (B) Lower wave number

   (C) Lower wavelength

   (D) None of these

7. Hypsochromic effect in IR spectrum

   (A) Lowers the wavelength of absorption

   (B) Lowers the intensity of absorption

   (C) Increases the wavelength of absorption

   (D) Increase the frequency of absorption

8. Which of the following electronic arrangement is most stable?

   (A) Single states (S_1)

   (B) Triplet state (T_1)

   (C) Singlet state (S_2)

   (D) Triplet state (T_2)

9. Quantum yield for most photochemical reaction is either less or greater than I whereas it should have been I according to Einstein law. It is because of

   (A) Primary processes

   (B) Secondary processes

   (C) Termination processes

   (D) None of these

10. Benzophenone reacts with isopropyl alcohol in presence of light to form benzopinacol. the reaction is an example of

    (A) Photodimerization

    (B) Photoreduction

    (C) Photoisomezization

    (D) Photodegradation

11. Direet irradiation of butadiene along results in the reaction

    (A) Photodimerization

    (B) Photoreduction

    (C) Photoisomerization

    (D) Photooxidation

12. Photolysis of acetone at room temperature to yield biacetyl and other products is

    (A) Norrish type I reaction

    (B) Norrish type II reaction

(C) Paterno Buchi reaction
(D) None of these

13. Photodimerization of dibenzyl ketone to form dibenzyl and CO is a reaction known as
(A) Photodimerization
(B) Photoisomerization
(C) Norrish type I reaction
(D) Norrish type II reaction

14. Hexane-2-one undergoes photolysis to form propene and acetone. The reaction is an example of
(A) Norrish type I reaction
(B) Norrish type II reaction
(C) Paterno Buchi reaction
(D) Photoaddition

15. Norrish type II reaction involve
(A) Proton abstraction
(B) Hydride ion abstraction
(C) Hydrogen abstraction
(D) Rearrangement without abstraction

16. Reaction of ketones and alkenes in the presence of light to form oxetanes is known as
(A) Norrish type I reaction
(B) Norrish type II reaction
(C) Diels-Alder reaction
(D) Paterno Buchi reaction

17. Photoirradiation of cyclic α, β-unsaturated ketones results in
(A) Phtoreduction
(B) Photoisomerization
(C) Photodegradation
(D) Photodimerization

18. Which of the following will absorb at higher wavelength in UV region?
(A) 1,4-Pentadiene (B) 1,3-Pentadiene
(C) Naphthalene (D) Anthracene

19. Which of the following factor will not shift the absorption of ultraviolet radiation to longer wavelength?
(A) Conjugation (B) Resonance
(C) Auxochrome
(D) Steric hindrance

20. Greatest energy is associated with which radiations
(A) Ultraviolet (B) Visible
(C) Infrared (D) X-ray

21. The electronic transition which required maximum energy is
(A) $\sigma \rightarrow \sigma^*$ (B) $\pi \rightarrow \pi$
(C) $n \rightarrow \pi$ (D) $n \rightarrow \sigma^*$

22. The value of molar extinction coefficient (ϵ) is related to
(A) Wavelength of absorption
(B) Frequency of absorption
(C) Probability of transition
(D) All of these

23. Force constant gives an idea about the
(A) Dipole moment of bond
(B) Strength of bond
(C) Reduced mass
(D) Wave number of absorption

24. For a linear molecule the number of vibrational degree of freedom are (where n = number of atoms)
(A) 3n – 6 (B) 3n – 5
(C) 3n
(D) Depends on type of atoms

25. Which of the following pair of compounds cannot be distinguished on the basis of UV spectra?
(A) 1,3-Pentadiene and 1,4-Pentadiene
(B) Benzene and naphthalene
(C) Ethyl format and methyl acetate
(D) Acetaldehyde and benzaldehyde

26. A chemical reaction that occurs as a consequence of light absorption is called
(A) Photochemical reaction
(B) Photoreduction
(C) Chemiluminescence
(D) Fluorescence

27. Dissociation of molecule to form free radicals on absorption of light is
(A) Primary process
(B) Secondary process
(C) Fluorescence
(D) Phosphorescence

28. Absorption of radiation by olefins in proper ultraviolet region results in the electronic transition of the type
(A) $\sigma \rightarrow \sigma$ (B) $\sigma \rightarrow \pi$
(C) $\pi \rightarrow \pi$ (D) $n \rightarrow \pi$

29. Excited state formed initially by absorption of radiation by a molecule is generally
(A) Singlet state (B) Triplet state
(C) Transition state
(D) None of these

30. The absorption of light by molecules undergoing photochemical reactions generally results in
(A) Phosphorescence
(B) Fluorescence
(C) Homolytic fission
(D) Heterolytic fission

31. Magnetic properties are not observed in nuclei with
(A) Odd mass number and odd atomic number
(B) Even mass number and odd atomic number
(C) Odd mass number and even atomic number
(D) Even mass number and even atomic number

32. The nuclei insensitive to nuclear magnetic resonance is
(A) ^{1}H (B) ^{2}H
(C) ^{19}F (D) ^{16}O

33. The spin quantum number (S) for proton
(A) Zero (B) 1/2
(C) 1 (D) 3/2

34. Spinning proton can take up how many orientations in an applied magnetic field
(A) 1 (B) 2
(C) 4 (D) 6

35. Resonance is said to occur when the frequency of electromagnetic radiation in a constant magnetic field is equal to ——— of spinning nuclei
(A) Precessional frequency
(B) Spin quantum number
(C) Spinning frequency
(D) All of these

36. The separation of resonance frequencies of protons in different structural environments from some chosen standard is known as
(A) Proton resonance
(B) Chemical shift
(C) Spin-spin splitting
(D) Chemical exchange

37. Which of the following is independent of applied magnetic field in the PMR spectroscopy?
(A) Chemical shift
(B) Spin-spin splitting
(C) Both of these (D) None of these

38. An organic compound which gives only one peak in PMR spectroscopy is likely to be
(A) $CH_3-CH(CH_3)-CH_2-CH_3$
(B) $CH_3CH_2CH_2CH_2CH_3$
(C) $CH_3-CH(CH_3)-CH_3$
(D) $CH_3-C(CH_3)_2-CH_3$

39. The compound shows the following PMR spectrum only
(i) Triplet for 3 protons
(ii) Quartet for 2 protons
It is likely to be
(A) CH_3CH_2OH (B) $CH_3CH_2OCH_3$
(C) CH_3CH_2Br (D) $CH_3—O—CH_3$

40. The absorption peak of hydrogen at marked central carbon of $CH_3 — \underset{\displaystyle OH}{\underset{|}{C}H} — CH_3$ in a high resolution PMR spectra is split into
(A) Triplet (B) Hextet
(C) Heptet (D) Octet

41. How many absorption peaks will appear in the PMR spectra of CH_3COCH_3
(A) 1 (B) 2
(C) 4 (D) 6

42. PMR spectra of CH_3CHO may be described as
(A) Duplet for 3 protons and quartet for 1 proton
(B) Quartet for 3 protons and duplet for 1 proton
(C) Singlet for 3 protons and duplet for 1 proton
(D) Duplet for 3 protons and singlet for 1 proton

43. Mass spectrometry studies the spectrum of
(A) Negatively charged ions
(B) Positively charged ions
(C) Neutral radicals
(D) All of these

44. The parent molecular ion in mass spectrometry is used to determine
(A) Functional group
(B) Bond energy
(C) Molecular weight
(D) All of these

45. Mass spectrum of an alcohol gives a strong peak at m/e 31. The alcohol is likely to be a
(A) Primary alcohol
(B) Secondary alcohol
(C) Tertiary alcohol
(D) Any one of these

46. The parent molecular ion $[C_6H_5COCH_3]^+$ is likely to fragment as
(A) $\dot{C}H_3 + C_6H_5 — \overset{+}{C} = O$
(B) $\dot{C}_6H_5 + CH_3 — \overset{+}{C} = O$
(C) $\overset{+}{C}H_3 + C_6H_5 — \dot{C} = O$
(D) $\overset{+}{C}_6H_5 + CH_3 — \dot{C} = O$

47. The number of rings and double bonds in a positive ion having the formula $C_7H_7^+$ is
(A) One ring + 2 double bonds
(B) Two rings + 1 double bond
(C) One ring + 3 double bonds
(D) Two rings + 3 double bonds

48. An organic compound molecular formula $C_6H_{10}O$ shows λ_{max} in UV at 240 nm and three singlet peaks in PMR spectrum. It is likely to be
(A) $CH_3 — \underset{}{\overset{CH_3}{\overset{|}{C}}} = CH — \overset{O}{\overset{\|}{C}} — CH_3$
(B) $CH_3 — CH = CH — CH = O$
(C) $CH_3 — \overset{C_2H_5}{\overset{|}{C}H} = CH — CH = O$
(D) $CH_3 — CH = \overset{CH_3}{\overset{|}{C}} — \overset{O}{\overset{\|}{C}} — CH_3$

49. Which of the following best describes the PMR spectrum of C_6H_5CHO?
(A) Two singlet peaks
(B) One duplet peak + One hexatet peaks
(C) One duplet + One singlet peaks
(D) Two duplet peaks

50. PMR spectra of ethyl acetate is essentially
(A) One quartet, one triplet and one singlet peaks
(B) One triplet, one duplet and one singlet peaks
(C) Two triplet and one singlet peaks
(D) Three singlet peaks

51. In which region of the electromagnetic spectrum does oxygen absorb?
(A) 10-200 nm (B) 200-400 nm
(C) 400-800 nm (D) None of these

52. Which of the following electronic transition occurs when ethane is exposed to ultraviolet radiation?
(A) σ-σ* (B) π-π*
(C) n-σ* (D) n- π*

53. Which of the following electronic transition occurs when acetone is exposed to visible radiation?
(A) π-π* (B) n-σ*
(C) n- π* (D) None of these

54. Which of the following electronic transition cannot be studied by quartz ultraviolet spectroscopy?
(A) σ-σ* (B) π-π*
(C) n-σ* (D) n- π*

55. Which of the following electronic transition occurs when methanol is exposed to ultraviolet radiation?
(A) π-π* (B) n-σ*
(C) n- π* (D) None of these

56. Which of the following is an allowed transition?
(A) π-π* (B) n- π*
(C) Both of these (D) None of these

57. Which of the following is a forbidden transition?
(A) π-π* (B) n-σ*
(C) n- π* (D) None of these

58. Which of the following is used as source of visible radiation?
(A) Tungsten filament lamp
(B) Hydrogen discharge lamp
(C) Deuterium discharge lamp
(D) All of these

59. Which of the following solvents cannot be used for the UV/VIS spectral study of aldehydes?
(A) n-hexane (B) Cyclohexane
(C) Ethanol (D) Acetronitrite

60. What is the wavelength range of ordinary infrared region?
(A) 0.8-2.5μm (B) 2.5-16μm
(C) 16-1000μm (D) 400-800nm

61. The position of an infrared absorption band is commonly express by
(A) Wavelength (B) Wave number
(C) Nanometer (D) None of these

62. Which of the following modes of vibrations is different from the other?
(A) Stretching (B) Bending
(C) Deformation (D) All of these

63. Which of the following modes of vibrations is in-plane bending?
(A) Rocking (B) Twisting
(C) Wagging (D) None of these

64. What is the vibration degree of freedom of a molecule of methane?
(A) Five (B) Nine
(C) Fifteen (D) None of these

65. Which of the following bonds show stretching absorption in the 3700-2500 cm^{-1} region?
(A) C-C (B) C-O
(C) C-N (D) None of these

66. Which of the following bonds do not show stretching absorption in the 3700-2500 cm^{-1} region?
(A) C-C (B) C-H
(C) O-H (D) N-H

67. Which of the following is not used as a source of IR radiation?
(A) Nernst filament
(B) Tungsten filament
(C) Globar (D) None of these

68. Which material is used for making the circular flat plates to hold the sample for IR study?
(A) Glass (B) Quartz
(C) Rock salt (D) All of these

69. In which form can a solid sample be studied by IR spectroscopy?
(A) As a mull (B) As a KBr disc
(C) As a solution (D) Any of these

70. Which of the following can be used to prepare the mull of a solid sample for its IR study?
(A) Nujol (B) Benzene
(C) Toluene (D) Water

71. Which of the following is commonly used as a solvent for IR study?
(A) Water (B) Ethanol
(C) Methanol (D) None of these

72. Which of the following is not commonly used as a solvent for IR study?
(A) Ethanol (B) Chloroform
(C) Carbon tetrachloride
(D) Carbon disulfide

73. Where does the =C-H stretching absorption of an olefin appear in an infrared spectrum?
(A) At 3000 cm^{-1}
(B) Above 3000 cm^{-1}
(C) Below 3000 cm^{-1}
(D) In the 1650-1600 cm^{-1}

74. Which of the following compounds does not absorb light in the UV/visible spectrum?
(A) Aspirin (B) Phenol
(C) Benzene (D) All the above

75. In infrared spectroscopy which frequency range is known as the fingerprint region?
(A) 1400 - 1200 cm^{-1}
(B) 400 – 900 cm^{-1} (C) 900 – 600 cm^{-1}
(D) 600 – 250 cm^{-1}

76. In UV-visible absorption Spectrophotometer, what does absorbance measure?
(A) The fraction of light of a particular wavelength absorbed by a sample
(B) The fraction of light of a particular wavelength transmitted by a sample
(C) The total amount of light energy absorbed by a sample
(D) The intensity of light that emerges from a sample

77. The main advantage of fluorescence over UV-vis spectroscopy is
(A) Its sensitivity
(B) Its compatibility with separation techniques
(C) That emission spectra give fairy sharp peaks
(C) Its compatibility with most analytes

78. Infrared spectroscopy provides valuable information about
(A) Molecular weight.
(B) Melting point. (C) Conjugation.
(D) Functional groups

79. A strong signal at 3400 cm^{-1} in an IR spectrum indicates the presence of a(n)
(A) Alcohol (B) Amine
(C) Carbonyl (D) Alkane

80. Which of the following bonds would be expected to have the highest frequency stretch?
(A) Carbon–carbon single bond
(B) Carbon–carbon double bond
(C) Carbon–carbon triple bond
(D) Carbon–bromine single bond

81. Which of the following bonds would be expected to have the lowest frequency stretch?
(A) C–Cl (B) C–I
(C) C–Br (D) C–F

82. In UV-Visible spectroscopy, if an auxochrome shifts the position of absorption to longer wavelength there will be
(A) Hyperchromic effect
(B) Hypochromic effect
(C) Bathochromic shift
(D) Hypsochromic shift

83. In UV-Visible spectroscopy, if an auxochrome shifts the position of absorption to shorter wavelength there will be
(A) Hypochromic effect
(B) Hyperchromic effect
(C) Bathochromic shift
(D) Hypsochromic shift

84. Homodienic components ——— than heterodienic system
(A) Equally shift the position of absorption to longer wavelength
(B) Shifts the position of absorption less to the longer wavelength
(C) Shifts the position of absorption more to the longer wavelength
(D) None of these

85. In ^{1}H-NMR circulating pi-electrons of benzene add to
(A) Deshielding effect
(B) Shielding effect
(C) Both of these (D) None of these

86. In H-NMR high electron density in acetylene adds to
(A) Shielding effect
(B) Deshielding effect
(C) Both of these (D) None of these

87. In evaluating chemical shift value, the nucleus that is deshieled will have
(A) Higher chemical shift value
(B) Lower chemical shift value
(C) May have lower or higher value
(D) None of these

88. Woodward Fieser rules are applied for
(A) Allenes
(B) Cyclic Hydrocarbons
(C) α, β, Unsaturated carbonyl compounds
(D) Non conjugated polymer

89. Homoannular diene has λ_{max} value according to Woodward Fieser rules
(A) 214 (B) 217
(C) 234 (D) None of them

90. Which statement represents Auxochrome
(A) Ph-
(B) Ethene & Ethyne
(C) -OH, -NH_2, -OR
(D) All of the above

91. Which part of spectrophotometer is used to convert electromagnetic radiation in to monochromatic radiation
(A) Monochromator
(B) Deuterium lamp
(C) Detector
(D) None of the above

92. Scissoring, rocking, wagging are the vibration
(A) Stretching vibration
(B) Symmetrical vibration
(C) Both a & b
(D) Bending vibration

93. Aromatics, have diagonistic peaks in the ——— region of IR spectra
(A) 1200-1000 cm^{-1}
(B) 1700-1500 cm^{-1}
(C) 900-700 cm^{-1} (D) None of above

94. Carbonyl shows absorption peaks in IR spectra
(A) 2300-2100 cm^{-1}
(B) 1200-1000 cm^{-1}
(C) Both a& b
(D) 1900-1600 cm^{-1}

95. Monochromator used in UV spectroscopy ———
(A) Grating (B) Glass prism
(C) Laser (D) Glass print

96. Absorbed wavelengths in atomic absorption spectrum appear as
(A) Dark background
(B) Dark lines
(C) Light background
(D) Light lines

97. Lines which appear in absorption and emission spectrum are
(A) Same (B) Different
(C) Very different (D) Far apart

98. Background in atomic absorption spectrum is
(A) Bright (B) Dark
(C) Brown (D) Purple

99. Atomic spectra is an example of
(A) Line spectra
(B) Continuous spectra
(C) Band spectra (D) Both A and B

100. Moderrn method for separation of isotopes is
(A) Laser separation
(B) Chromatography
(C) Ionization (D) X-ray

101. In new spectrometers each ion hits a
(A) Detector (B) Ionizer
(C) Collector (D) Graph

102. Mass spectrometer use to determine isotopes in solid state is
(A) Bohr's (B) Aston's
(C) dempester's (D) Allison's

103. In accelerating chamber of mass spectrometer potential difference is
(A) 500-2000 (B) 600-7000
(C) 300-8000 (D) 700-9000

104. Instrument use to collect ions is
(A) Electrometer (B) Ionizer
(C) Spectrometer (D) None

105. Near ultraviolet region of the electromagnetic spectrum generally lies between
(A) 10–200 nm (B) 200–400 nm
(C) 400–750 nm (D) 300–500 nm

106. Far ultraviolet or vacuum ultraviolet region generally lies between
(A) 10–200 nm (B) 200–400 nm
(C) 400–750 nm (D) 300–500 nm

107. Far infrared region of the electromagnetic radiation generally lies between
(A) 50–200 μm (B) 100–400 μm
(C) 50–1000 μm (D) 1–20 μm

108. Microwave region of electromagnetic spectrum generally lies between
(A) 0.1–100 cm (B) 50–100 cm
(C) 500–1000 cm (D) 50–150 cm

109. Radio waves region of the spectrum generally lies between
(A) 1–100 m (B) 500–1000 m
(C) 1–1000 m (D) 100–500 m

110. For a particular molecular species, this of the following terms is function of concentration
(A) Absorbance
(B) Percent transmission
(C) Transmission (D) All

111. Which of the following are classified as heat detectors?
(A) Thermocouple (B) Thermister
(C) Bolometer (D) All

112. Photomultipliers are very sensitive and rapid in their response and are used as
(A) Detector
(B) Monochromator
(C) Amplifier (D) All

113. The most widely used flame in atomic absorption is
(A) Air-coal gas (B) Air-propane
(C) Air-acetylene (D) Oxyacetylene

114. Which of the following devices is most commonly used for the formation of an atomic vapour in atomic absorption?
(A) Flame atomization
(B) Electric atomization
(C) Sputtering devices
(D) Ovens

115. Which of the following molecules show rotational spectra?
(A) HCl (B) CO
(C) CH_3Cl (D) All

116. Which of the following statements are correct?
(A) NO, CO, HCl and $CHCl_3$ are infrared active
(B) CO_2, H_2O, CH_4 and C_2H_4 are infrared active
(C) Both are correct
(D) None is correct

117. In vibrational rotational bands, the frequency or wavelength of absorption depends on.
(A) Relative masses of the atoms
(B) The force constant of the bonds
(C) Geometry of the atoms
(D) All

118. Which of the following involve a change in bond angle with reference to a set of co-ordinates arbitrarily set up within the molecule?
(A) Rocking (B) Twisting
(C) Torsional vibration
(D) All

119. Which of the following statements are correct?
(A) Molecule of N atoms has 3N degrees of freedom
(B) In a non-linear molecule, 3 degrees of freedom describe rotation and there describe transition.
(C) In non-linear molecule 3N – 6 degrees of freedom are vibrational degrees of freedom
(D) All are correct

120. In order to excite the spectra of many metals in flame photometry which of the following is /are good oxidants
(A) Oxygen (B) Nitrogen
(C) Nitrous oxide (D) All

121. The best flame temperature for an analysis is determined empirically and depends upon.
(A) Excitation energy of the element
(B) How it is combined in the sample
(C) The sensitivity required
(D) Presence of other elements

122. Which of the following process may occur in flames?
(A) Translational, vibrational and rotational motions
(B) Excitation (C) Ionization
(D) Dissociation

123. Heteronulear diene has λ_{max} value according to Woodward Fieser rules
(A) 214 (B) 217
(C) 234 (D) None of them

124. According to Woodward Fieser rules an increment of ———— is added to parent value for exocyclic double bond
(A) 214 (B) 30
(C) 15 (D) 5

125. According to Woodward Fieser rules an increment of -------is added to parent value for alkyl substituent or ring residue
(A) 214 (B) 30
(C) 15 (D) 5

126. According to Woodward Fieser rules an increment of -------is added to parent value for double bond extended conjugation

(A) 214 (B) 5

(C) 15 (D) 30

127. The IR spectrum of amines show N-H stretching at

(A) 2050- 3550 cm^{-1}

(B) 1050- 3550 cm^{-1}

(C) 4050- 5550 cm^{-1}

(D) 3050- 3550 cm^{-1}

128. The IR spectrum of carboxylic acid show O-H stretching at

(A) 1250- 3550 cm^{-1}

(B) 1050- 3550 cm^{-1}

(C) 4050- 5550 cm^{-1}

(D) 2500- 3550 cm^{-1}

129. The IR spectrum of carboxylic acid show >C-O stretching at

(A) 2050- 3550 cm^{-1}

(B) 1050- 3550 cm^{-1}

(C) 4050- 5550 cm^{-1}

(D) 1700- 1750 cm^{-1}

130. The IR spectrum of aldehydes and ketones show strong >C-O stretching at

(A) 2050- 3550 cm^{-1}

(B) 1050- 3550 cm^{-1}

(C) 4050- 5550 cm^{-1}

(D) 1700- 1750 cm^{-1}

131. The IR spectrum of phenol show O-H stretching at

(A) 2050- 3550 cm^{-1}

(B) 1050- 3550 cm^{-1}

(C) 4050- 5550 cm^{-1}

(D) 3200- 3550 cm^{-1}

132. The IR spectrum of alcohos show O-H stretching at

(A) 2050- 3550 cm^{-1}

(B) 1050- 3550 cm^{-1}

(C) 4050- 5550 cm^{-1}

(D) 3580- 3650 cm^{-1}

ANSWERS

1. A	2. C	3. A	4. C
5. A	6. B	7. A	8. B
9. B	10. B	11. A	12. A
13. C	14. B	15. C	16. D
17. D	18. D	19. D	20. D
21. A	22. C	23. B	24. B
25. C	26. A	27. A	28. C
29. A	30. C	31. D	32. D
33. B	34. B	35. A	36. B
37. B	38. D	39. C	40. D
41. A	42. D	43. B	44. C
45. A	46. A	47. C	48. A
49. A	50. A	51. A	52. A
53. D	54. A	55. A	56. A
57. B	58. A	59. C	60. B
61. B	62. A	63. B	64. B
65. D	66. A	67. B	68. C
69. D	70. A	71. D	72. A
73. B	74. D	75. B	76. B
77. A	78. D	79. B	80. D
81. B	82. C	83. D	84. C
85. A	86. A	87. A	88. C
89. D	90. C	91. A	92. D
93. C	94. D.	95. A	96. B
97. A	98. A	99. A	00. A
101. A	102. C	103. A	104. A
105. B	106. A	107. A	108. A
109. A	110. D	111. D	112. A
113. C	114. C	115. D	116 C
117. D	118. D	119. D	120. D
121. C	122. C	123. A	124. D
25. D	126. D	127. D	128 D
129. D	130. D	131. D	132. D

2.16. CHEMISTRY OF HETEROCYCLIC COMPOUNDS

1. IUPAC name of pyridine is
(A) Azole (B) Azine
(C) Azolidine (D) Diazine

2. Which of the following is most basic in nature?
(A) Pyrrole (B) Aniline
(C) Pyridine (D) Thiophene

3. In pyridine the electrophilic substitution occur at
(A) α-position (B) β-position
(C) γ-position (D) May occur at any of these positions

4. Pyridine is
(A) Monoacid tertiary base
(B) Diacid tertiary base
(C) Monoacid secondary base
(D) Diacid secondary base

5. Nucleophilic substitution in pyridine occurs at
(A) α-position (B) β-position
(C) N-atom (D) Pyridine does not undergo these reactions

6. The hybridization of nitrogen atom in pyridine is
(A) sp (B) sp^2
(C) sp^3
(D) It is not hybridized

7. Oxidation of pyridine by per acids results in the formation of
(A) Piperidine
(B) Pentamethylene diamine
(C) Picolinic acid (D) Pyridine-I-oxide

8. Vitamin B_6 (pyridoxal) has the basic ring structure of
(A) Pipeidine (B) Pyrrole
(C) Pyridine (D) Pyrrolidine

9. Which of the following is least basic?
(A) Pyridine (B) Quinoline
(C) Isoquinoline (D) Pyrrole

10. Skraul synthesis is used to prepare
(A) Pyridine (B) Quinoline
(C) Isoquinoline (D) All of these

11. Which of the following is not a monoacid tertiary base?
(A) Pyridine (B) Pyrrole
(C) Quinoline (D) Isoquinoline

12. Quinoline on oxidation with $KMnO_4$ gives
(A) Quinolinic acid (B) Nicotinic acid
(C) Picolinic acid (D) All of these

13. Electrophilic substitution in quinoline occurs at
(A) 2-position (B) 3-position
(C) 3- and 5-position
(D) 5- and 8-position

14. Nucleiphilic substitution in quinoline occurs at
(A) α-position (B) β-position
(C) γ-position (D) At N-atom

15. In isoquinoline the nucleophilic substitution occurs, readily at
(A) 1-position (B) 3-position
(C) 4-position (D) 5-position

16. Oxidation of isoquinoline with alk $KMnO_4$ gives
(A) Quinolinic acid (B) Nicotinic acid
(C) Picolinic acid (D) Phthalic acid

17. Bischler-Napieralski synthesis is used to prepare
(A) Quinoline (B) Isoquinoline
(C) Pyridine (D) Pyrazine

18. Which of the following is an heterocyclic compound not having two nitrogen atoms in the same ring?
(A) Isoxazole (B) Pyridazine
(C) Pyrimidine (D) Pyrazine

19. Phenazone is an important drug used as
(A) Febrifuge (B) Antiseptic
(C) Antibacterial (D) All of these

20. Nitration of isoquinoline occurs mainly at
(A) 1-position (B) 3-position
(C) 5- and 8-position
(D) 3- and 6-positions

ANSWERS

1. B	2. C	3. B	4. A
5. A	6. B	7. D	8. C
9. D	10. B	11. B	12. A
13. D	14. A	15. A	16. D
17. B	18. A	19. A	20. C

2.17. CHEMISTRY OF CARBOHYDRATES

1. How many isomeric aldoses are possible for the molecular formula $C_6H_{12}O_6$?
(A) 2 (B) 4
(C) 8 (D) 16

2. Carbohydrates are characterized by the presence of
(A) Hydroxyl group
(B) Carbonyl group
(C) Asymmetric carbon
(D) All of these

3. Which of the following is not a polysaccharide?
(A) Cellobiose (B) Cellulose
(C) Insulin (D) Amylase

4. Glucose and fructose react with which of the following reagent to give same product
(A) Tollen's reagent
(B) Phenyl hydrazine
(C) Hydroxyl amine
(D) All of these

5. In the presence of dilute alkali monosaccharides undergo reversible isomerisation. The reaction known as
(A) Kiliani reaction
(B) Weermann rearrangement
(C) Lobry de Bruyn van Ekenstein rearrangement
(D) Mutarotation

6. Epimers are compounds that differ in
(A) Functional group
(B) Configuration at α-carbon
(C) Ring size
(D) Configuration at any carbon

7. Method used to ascent the series of aldoses is known as
(A) Kilian synthesis
(B) Ruff's method
(C) Weerman's reaction
(D) Wohl's synthesis

8. Mutarotation is exhibited by
(A) All monosaccharides
(B) All disaccharides
(C) All polysaccharides
(D) All carbohydrates

9. A freshly prepared solution of glucose has a specific rotation of +110° but on keeping for some time it changes to +52.7°. the phenomenon is known as
(A) Epimerization (B) Alternation
(C) Mutarotation (D) None of these

10. Though fructose is laevorotatory yet its name is written as D-fructose, this 'D'-prefix indicate
(A) Specific rotation
(B) Generic relationship with d-glyceraldehydes
(C) Mutarotation
(D) Generic relationship with d-glucose

11. Configuration of carbohydrates relative to glyceraldehydes was suggested by
(A) Rosanoff (B) Fischer
(C) Howarth (D) Hirst

12. A specific diagnostic test for carbohydrates is
(A) Fehling's test (B) Tollen's test
(C) Molisch's test
(D) Osazone formation

13. Glucose and mannose may be obtained by Kiliani synthesis from
(A) D-arabinose (B) D-xylose
(C) D-ribose (D) D-lyxose

14. Acetylation of fructose yields a
(A) Monodactyl derivative
(B) Diacetyl derivative
(C) Tetraethyl derivative
(D) Pentacetyl derivative

15. Although glucose has an aldehydic group it does not restore pink colour of Schiff's reagent. It is because
(A) There is steric hindrance
(B) -I effect of hydroxyl groups
(C) Aldehydic group is involved in hemiacetal formation
(D) There is no aldehydic group in glucose

16. Isomers differing in configuration at the asymmetric carbon produced due to hemiacetal ring formation in carbohydrates are known as
(A) Anomers (B) Epimers
(C) Conformers (D) Tautomers

17. The ring structure of glucose does not explain
(A) No reaction with Schiff's reagent
(B) Mutarotation phenomenon
(C) Existence of two forms of glucose
(D) Stereochemistry of glucose

18. Hydrolysis of methyl tetramethyl-D-glucoside followed by oxidation gives
(A) Arabinotrimethoxy glutaric acid
(B) Xylotrimethoxy glutaric acid
(C) Ribotrimethoxy glutaric acid
(D) Dimethoxy succinic acid

19. Which of the polysaccharide on hydrolysis gives only fructose?
(A) Cellulose (B) Amylopectin
(C) Amylose (D) Inulin

20. The test that may be used to distinguish between glucose and fructose is
(A) Selivenoff's test
(B) Schiff's reagent test
(C) Tollen's reagent test
(D) Fehling's solution test

21. Which of the following is not a method for determining ring size in carbohydrates?
(A) Haworth and Hirst method
(B) Lactone formation method
(C) Periodic acid oxidation method
(D) Molisch method

22. Nucleoside adenosine on hydrolysis gives
(A) Purine base + Ribose
(B) Purine base + Deoxyribose
(C) Pyrimidine base + Ribose
(D) Pyrimidine base + Deoxyribose

23. In nucleosides the ring size of sugar and configuration at anomeric carbon are respectively
(A) Furanose, α-anomer
(B) Furanose, β-anomer
(C) Pyranose, α-anomer
(D) Pyranose, β-anomer

24. Treatment of sucrose with conc. HNO_3 gives
(A) Nitrosucrose
(B) Glucose + Fructose
(C) Oxalic acid (D) Laevulinic acid

25. Which of the following reaction is shown by sucrose?
(A) Osazone formation
(B) Tollen's test
(C) Oxime formation
(D) Molisch's test

26. Methylation of sucrose yields
(A) Monomethyl derivative
(B) Dimethyl derivative
(C) Tetramethyl derivative
(D) Octamethyl derivative

27. Inverted sugar is
(A) Sucrose
(B) Any mixture of glucose and fructose
(C) Mixture of glucose and fructose obtained on hydrolysis of sucrose
(D) Hydrolysis product of insulin

28. The systematic name of sucrose is
(A) 1-α-D-glucopyranosyl-2-β-D-fructopyranoside
(B) 1-α-D-glucopyranosyl-2-β-D-fructofuranoside
(C) 1-β-D-glucofuranosyl-2-α-D-fructopyranoside
(D) 1-β-D-glucofuranosyl-2-α-D-fructofuranoside

29. Which of the following disaccharide is a nonreducing sugar?
(A) Lactose (B) Sucrose
(C) Maltose (D) Maltase

30. Hydrolysis of D-lactose gives
(A) Glucose + Fructose
(B) Galactose + Fructose
(C) Glucose + Galactose
(D) It is not hydrolysed

31. Which of the following is a disaccharide which on hydrolysis gives only one specific monosaccharide?
(A) Sucrose (B) Lactose
(C) Maltose (D) None of these

32. Identify a trisaccharide
(A) Lactose (B) Raffinose
(C) Amylose (D) Gentiobiose

33. Which of the following is not a characteristic of amylase?
(A) It consists of α-D-glucopyranose units
(B) It is linear polymer
(C) It has 1,4-α-glycosidic linkages
(D) It is a reducing carbohydrate

34. Which of the following is not a form of cellulose?
(A) Silk (B) Cotton
(C) Jute (D) Hemp

35. The main difference in the structure of constituting units of starch and cellulose is
(A) In starch α-D-glucopyranose units are present while in cellulose these are β-D-glucopyranose units
(B) In starch α-D-glucofuranose units are present while in cellulose these are β-D-glucofuranose units
(C) In starch β-D-glucopyranose units are present while in cellulose these are α-D-glucopyranose units
(D) In starch β-D-glucofuranose units are present while in cellulose these are α-D-glucofuranose units

36. The reagent which may be used to distinguish between starch and cellulose is
(A) Tollen's reagent
(B) Iodine solution
(C) Acetic anhydride
(D) Fehling's solution

37. Synthetic silk known as viscose rayon is
(A) Cellulose nitrate
(B) Regenerated starch
(C) Regenerated cellulose
(D) None of these

38. Collodion or pyroxlin is
(A) Cellulose trinitrate
(B) Mixture of cellulose mono-and dinitrates
(C) Cellulose triacetate
(D) Mixture of cellulose mono- and diacetates

39. Which one of the following is non-reducing disaccharide?
(A) Lactose (B) Cellobiose
(C) Maltose (D) None of these

40. Hydrolysis of starch with enzyme amylase produces
(A) Dextrins (B) Maltose
(C) Glucose (D) All of these

ANSWERS

1. D	2. D	3. A	4. B
5. C	6. B	7. A	8. A
9. C	10. B	11. D	12. C
13. A	14. D	15. C	16. A
17. D	18. B	19. D	20. A
21. D	22. A	23. B	24. A
25. D	26. D	27. C	28. A
29. B	30. C	31. D	32. B
33. D	34. A	35. A	36. B
37. C	38. B	39. D	40. A

2.18. CHEMISTRY OF PROTEINS

1. Which of the following reaction cannot be used for the synthesis of α-amino acids?
   (A) Gabriel phthalimide
   (B) Streckers synthesis
   (C) Sorensen synthesis
   (D) Schmidt synthesis

2. Amino acids have
   (A) Acidic group (B) Basic group
   (C) Both of these (D) None of these

3. Which of the following is capable of forming zwitter ion?
   (A) Amino acids (B) Halo acids
   (C) Hydroxy acids (D) All of these

4. Which of the following α-amino acid is not capable of exhibiting optical isomerism?
   (A) Glycine (B) Leucine
   (C) Alanine (D) Arginine

5. Select an acidic amino acid
   (A) Lysine (B) Cystine
   (C) Aspartic acid
   (D) Aminoacetic acid

6. Select a basic amino acid
   (A) Glycine (B) Cystine
   (C) Alanine (D) Lysine

7. Glycine reacts with nitrous acid to form
   (A) Methyl amine (B) Acetic acid
   (C) Zwitter ion (D) Glycollic acid

8. The isoelectric point of a protein or amino acid is
   (A) pH at which it does not have any charge
   (B) pH at which it does not have net charge and does not migrate in electric field
   (C) pH at which the concentration of cation is greater than anion
   (D) pH at which the concentration of anion is greater than cation

9. Which of the following is not a general property of amino acids?
   (A) They have high m.p. and b.p.
   (B) They are soluble in water
   (C) Their dipole moments are high
   (D) They are amorphous solids

10. Dry distillation of amino acids with barium hydroxide yields
    (A) Acids (B) Amines
    (C) Alcohols (D) Hydroxy acids

11. α-Amino acids when heated alone form
    (A) Cyclic lactum
    (B) α,β-unsaturated acid
    (C) Fatty acids
    (D) Diketopiperazines

12. Amino acids react with which of the following reagent to produce a blue colour
    (A) $LiAlH_4$ (B) Ninhydrin
    (C) $CHCl_3/KOH$
    (D) Brady's reagent

13. Estimation of nitrogen in proteins is generally carried out by the method
    (A) Duma's method
    (B) Van Slyke method
    (C) Kjeldahl's method
    (D) Carius method

14. Hydrolysis of proteins gives
    (A) α-amino acids only
    (B) β-amino acids only
    (C) γ-amino acids only
    (D) A mixture of all of these

15. Combination of α-amino acid through which linkages results result in formation of protein
(A) Ester linkage
(B) Glycosidic linkage
(C) Lactum linkage
(D) Peptide linkage

16. Albumin is classified as
(A) Simple protein
(B) Conjugated protein
(C) Lipoprotein
(D) Derived protein

17. Sanger's reagent is
(A) Carbobenzyloxy chloride
(B) Dimethyl amino sulphonyl chloride
(C) 1-Fluoro-2,4-dinitrobenzene
(D) 2,4-Dinitrophenyl hydrazine

18. Oxytocin, a pituitary hormone is
(A) Amino acid
(B) Polypeptide
(C) Protein
(D) Conjugated protein

19. Primary structure of protein refers to
(A) Amino acid sequence
(B) Arrangement of peptide chains
(C) Orientation of amino acids
(D) Whether it has α- or β-helix in space structure

20. Arrangement of peptide chains of protein in space to form helix structure is referred to as
(A) Primary structure
(B) Secondary structure
(C) Tertiary structure
(D) Quaternary structure

21. The study of coiled long peptide chains of protein to give a 3 dimensional structure is the study of
(A) Primary structure
(B) Secondary structure
(C) Tertiary structure
(D) Quaternary structure

22. Which of the following test is not shown by proteins?
(A) Xanthoproteic test
(B) Ninhydrin test
(C) Hopkin-Cole test
(D) Mulliken-Barker test

23. Coagulation of protein on treatment with heavy metal salts or heating is called
(A) Decolourisation
(B) Denaturation
(C) Sedimentation process
(D) Reversible precipitation

24. Ninhydrin test is given by
(A) Proteins
(B) Amino acids
(C) Both proteins and amino acids
(D) None of these

25. Digestion of protein is essentially
(A) Liberation of NH_3
(B) Hydrolysis to α-amino acids
(C) Combination of amino acids
(D) Change in secondary structure

26. Molecular weight of proteins may be determined by
(A) Osmotic pressure measurements
(B) Sedimentation methods
(C) Light scattering methods
(D) All of these

27. Putrefaction is
(A) Hydrolysis of proteins
(B) Reduction of proteins
(C) Bacterial oxidation of proteins
(D) All of these

28. Proteins have characteristics
(A) Melting point
(B) Isoelectric point
(C) Boiling point
(D) All of these

29. Enzymes are
(A) Complex nonliving compounds
(B) Living organisms
(C) Complex protein molecules
(D) Bacterial colonies

30. Trypsin, is an enzyme which
(A) Hydrolyses fats
(B) Hydrolyses proteins
(C) Oxidises proteins
(D) Oxidises carbohydrates

31. Oxidative enzymes are responsible for
(A) Biological processes
(B) Biological oxidations
(C) Biological hydrolysis
(D) Biological isomerisation

32. Enzymatic action is best at a fixed
(A) Temperature (B) pH
(C) Both of these (D) None of these

33. Apoenzyme is
(A) Hydrolytic enzyme
(B) Oxidative enzyme
(C) Coenzyme
(D) Protein part of enzyme after removal of coenzyme

34. Coenzyme can be separated from enzyme by
(A) Precipitation (B) Dialysis
(C) Hydrolysis (D) Distillation

35. An stereospecific enzyme is one which catalyses
(A) Formation of one stereoisomer
(B) Reaction of one stereoisomer only
(C) Both of these (D) None of these

36. Urease, an enzyme used to estimate urea is a
(A) Hydrolytic enzyme
(B) Oxidative enzyme
(C) Reductive enzyme
(D) Isomerising enzyme

ANSWERS

1. A	2. C	3. A	4. D
5. C	6. D	7. D	8. B
9. D	10. B	11. D	12. B
13. C	14. A	15. D	16. A
17. C	18. B	19. A	20. B
21. C	22. D	23. B	24. C
25. B	26. D	27. C	28. B
29. A	30. B	31. B	32. C
33. D	34. B	35. B	36. A

2.19. CHEMISTRY OF NUCLEIC ACIDS

1. Hydrolysis of nucleoprotein results in the formation of
   (A) Proteins (B) Nucleic acids
   (C) Both (A) and (B)
   (D) They do not hydrolyse

2. Complete hydrolysis of nucleotides results in the formation of
   (A) Heterocyclic bases
   (B) A pentose
   (C) A phosphate ion
   (D) All of these

3. The base which is not present in DNA is
   (A) Adenine (B) Uracil
   (C) Guanine (D) Thymine

4. Adenosine nucleoside has the base
   (A) Adenine (B) Guanine
   (C) Thymine (D) Cytosine

5. Which of the following is not a pyrimidine base?
   (A) Uracil (B) Thymine
   (C) Cytosine (D) Guanine

6. The one which is not a purine base
   (A) Cytosine (B) Adenine
   (C) Guanine (D) None of these

7. The sugar present in DNA is
   (A) D-ribose (B) D-glucose
   (C) 2-Deoxy-D-ribose
   (D) 3-Deoxy-D-ribose

8. The sugar present in RNA is
   (A) D-ribose (B) D-arabinose
   (C) D-glucose (D) Deoxyribose

9. The unit of nucleic acid having base-sugar combination is called
   (A) Nucleic acid (B) Nucleoside
   (C) Nucleotide (D) None of these

10. Cytosine, a pyrimidine base, pairs with
    (A) Guanine (B) Thymine
    (C) Adenine (D) Any of these

11. The number of hydrogen bonds holding A — T pair is
    (A) 1 (B) 2
    (C) 3 (D) 4

12. RNA is involved in the synthesis of
    (A) Proteins (B) Nucleic acid
    (C) Carbohydrates (D) Fats

13. The number of hydrogen bond present in G — C pair is
    (A) 1 (B) 2
    (C) 3 (D) 4

14. The formation of daughter DNA's from parent DNA is called
    (A) Translation (B) Transcription
    (C) Reproduction (D) Replication

15. The process of transfer of genetic message from DNA to m-RNA is known as
    (A) Replication (B) Translation
    (C) Transcription (D) Transference

16. Hydrogen bonds holding the strands of nucleic acids are formed between
    (A) Sugar and base units
    (B) Base units
    (C) Sugar and phosphate units
    (D) Sugar units

17. Codon for amino acid glycine is not represented by base pair
    (A) GCA (B) GGA
    (C) GGC (D) GGU

18. Anticodons in t-RNA's corresponding to different amino acids are
(A) Same as in codons
(B) Complimentary to codons
(C) Sometimes as (A) and (B) both
(D) Haphazard in arrangement

19. One arm of each t-RNA terminates in the base sequence
(A) UGU (B) GGC
(C) ACT (D) CCA

20. The binding site on ribosome for t-RNA and m-RNA is provided by
(A) Polysome
(B) Ribosomal RNA
(C) Codons (D) DNA

21. Biological role of nucleic acid does not include
(A) Genetic continuity
(B) Protein synthesis
(C) Hybridisation (D) Mutation

22. The steps involved in biosynthesis of; protein includes
(A) Translation (B) Transcription
(C) Both of these (D) None of these

ANSWERS

1. C	2. D	3. B	4. A
5. D	6. A	7. C	8. A
9. B	10. A	11. B	12. A
13. C	14. D	15. C	16. B
17. A	18. B	19. D	20. B
21. C	22. C		

2.20. GENERAL ORGANIC CHEMISTRY

1. Organic substances responsible for the smell of the flowers etc. are grouped together in chemistry as
(A) Perfumes (B) Terpenoids
(C) Flavonoids (D) Alkaloids

2. Ingold's isoprene rule states that in terpenoids isoprene units are joined
(A) Head to tail (B) Head to head
(C) Tail to tail
(D) In a random order

3. An example of acyclic monotoerpenoid is
(A) Dipentene (B) α-terpineol
(C) Myrcene (D) Limonene

4. Identify an oxygenated cyclic terpenoid
(A) α-pinene (B) Camphor
(C) Citral (D) Geranial

5. The terpenoid responsible for the smell
(A) Camphor (B) Carvone
(C) Geranial (D) Citral

6. Enfleurage process is used to extract the essential oils from
(A) Bark of plant (B) Seeds of plant
(C) Leaves of plant
(D) Flowers of plant

7. Which of the following is not a characteristic of terpenoids?
(A) They are pleasant smelling liquids
(B) they are steam volatile
(C) They are nitrogenous bases
(D) they are insoluble in water

8. The terpenoid present in oil of lemon grass is
(A) Citral (B) Geranial
(C) Nerol (D) α-terpineol

9. Citral when heated with $KHSO_4$ forms?
(A) Isoprene (B) p-cymene
(C) p-menthane (D) Dipentene

10. α-terpineol is obtained on hydration of which of the following with dilute H_2SO_4.
(A) Citral (B) Myrcene
(C) Linalool (D) Limonene

11. Peppermint oil contains
(A) Menthol (B) Thymol
(C) α-pinene (D) Camphene

12. Oil of turpentine contains
(A) α-pinene (B) β-pinene
(C) Both (A) and (B)
(D) None of these

13. α-pinene hydrochloride on warming rearranges to form bornyl chloride. The rearrangement is known as
(A) Pinacol-pinacolone
(B) Hofinann
(C) Wagner-Meerwein
(D) Wolff

14. A terpenoid which has an alcoholic group in the molecule is
(A) Citral (B) Camphor
(C) Carvone (D) Menthol

15. An example of acyclic polyterpenoid is
(A) Myrcene (B) Buna-S
(C) Synthetic rubber
(D) Natural rubber

16. A chromophore is an isolated fractional group which has
(A) Coloured appearance
(B) Absorption in UV-visible region
(C) Only sigma bonds
(D) Absorption in the region

17. A group that causes deepening of the colour is known as
(A) Bathochromic (B) Hypsochromic
(C) Hypochromic (D) Hyperchromic

18. An auxochrome is a group which
(A) Absorbs in UV region
(B) Absorbs in visible region
(C) Absorbs in IR region
(D) Increases absorption wavelength of chromophore

19. The light absorbed in UV and visible region causes
(A) Vibrational energy changes
(B) Rotational energy changes
(C) Electronic excitation
(D) All of these

20. Conjugation of chromophore
(A) Deepens the colour
(B) Lightens the colour
(C) Shifts absorption to shorter wavelength
(D) All of these

21. For a compound to act as a dye it must have
(A) A suitable colour
(B) Ability to fix to fibre
(C) Both (A) and (B)
(D) None of these

22. Which of the following is not a naturally occurring dye?
(A) Indigo (B) Indigotin
(C) Alizarin
(D) Malachite green

23. A mordant is a substance which is
(A) Coloured
(B) Leuco-base of a dye
(C) Fixes dye on the fabric
(D) All of these

24. Vat dyes are generally applied to the fabric in the form of
(A) Mordants (B) Leuco base
(C) Oxidised base (D) Dispersed dyes

25. The dyes which are produced on the fibre in situ by reactions are known as
(A) Mordant dyes (B) Fast dyes
(C) Ingrain dyes (D) Disperse dyes

26. Dyes which can be applied to cellulosic fibre from water solution are called
(A) Ingrain dyes
(B) Substantive dyes
(C) Mordant dyes (D) Vat dyes

27. Which of the following is not a characteristic of a dye?
(A) It must have suitable colour
(B) It must be able to fix to fibre
(C) It must be fast to wash and light
(D) It must be highly soluble in water

28. An example of nitro dyes is
(A) Martius yellow (B) Auramine O
(C) Malachite green
(D) Methyl red

29. Which of the following is a triphenylmethane dye?
(A) Auramine G (B) Crystal violet
(C) Fluorescein (D) Fast green O

30. The dye which is a constituent of Schiff's reagent used for detection of aldehydic group is
(A) Gentian violet
(B) Phenolphthalein
(C) Magneta (D) Rosolic acid

31. Eosin dye belongs to the group of dyes known as
(A) Nitroso dyes
(B) Triphenylmethane dyes
(C) Diphenylmethane dyes
(D) Phthalein dyes

32. Which of the following is an azo dye?
(A) Congo red (B) Rhodamine B
(C) Ertythrocin (D) Paraosaniline

33. Which of the following dye is used as an antiseptic?
(A) Methyl orange (B) Mercurochrome
(C) Alizarin (D) Bismarck brown

34. Indigotin is a dye obtained from indigo plant which belongs to the group of
(A) Substantive dyes
(B) Mordant dyes (C) Vat dyes
(D) disperse dyes

35. The dye obtained from madder root (Rubia tinctoria) is
(A) Indigotin (B) Indanthrene
(C) Acriflavin (D) Alizarin

36. Which of the following dyes belongs to the group of acridine dyes?
(A) Acriflavin (B) Alizarin
(C) Indigotin (D) Cyanine

37. Which of the following does not belong to the group of herocyclic dyes?
(A) Acridine (B) Cyanine
(C) Methylene blue (D) Amido black

38. Dyes used in photographic plates to make them panchromatic is
(A) Cyanine dyes (B) Azine dyes
(C) Phthalocyanine dyes
(D) Acridine dyes

39. Which of the following is not a characteristic of phthalocyanine dyés?
(A) They are metal complex
(B) They are insoluble in water
(C) They have porphin nucleus
(D) They are used in photographic plates

40. Identify a dye which was not originally obtained from plant source
(A) Alizarin (B) Tyrian purple
(C) Indigotin (D) Quercitrin

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44. Identify an oxygenated cyclic terpenoid
(A) α-pinene (B) Camphor
(C) Citral (D) Geranial

45. The terpenoid responsible for the smell of rose is
(A) Camphor (B) Carvone
(C) Geranial (D) Citral

46. Enfleurage process is used to extract the essential oils from
(A) Bark of plant (B) Seeds of plant
(C) Leaves of plant
(D) Flowers of plant

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(B) Hofmann
(C) Wagner-Meerwein
(D) Wolf

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55. An example of acyclic polyterpenoid is
(A) Myrcene (B) Alcoholic
(C) Synthetic rubber
(D) Natural rubber

56. Sterols are steroids having the functional group
(A) Ketonic (B) Alcoholic
(C) Phenolic (D) Aldehydic

57. All steroids on heating with selenium give
(A) Phenanthrene (B) Cholesterol
(C) Diels hydrocarbon
(D) Isoprene

58. Which of the following is not an androgen i.e., male sex hormones?
(A) Androsterone (B) Testosterone
(C) Oestrone
(D) All of these are male hormones

59. Which of the following does not have an α,β-unsaturated carbonyl group?
(A) Androsterone (B) Testosterone
(C) Oestrone (D) Progesterone

60. The steroid which plays an important role in carbohydrate metabolism is
(A) Oestrone (B) Progesterone
(C) Androsterone (D) Cortisone

61. The deficiency of which vitamin leads to beri-beri disease
(A) Thiamine (B) Riboflavin
(C) Pyridoxine (D) Ascorbic acid

62. The vitamin which is related to monosaccharides is
(A) Vitamin A (B) Vitamin C
(C) Vitamin D (D) Vitamin E

63. Antisterility vitamin is
(A) Vitamin C (B) Vitamin D
(C) Vitamin E (D) Vitamin K

64. Vitamin D_1 is chemically known as
(A) Ergocalciferol (B) Tocopherol
(C) Axerophthol (D) Phylloquinone

65. Vitamin which contains cobalt is
(A) Vitamin B_1 (B) Vitamin B_2
(C) Vitamin B_6 (D) Vitamin B_{12}

ANSWERS

1. B	2. A	3. C	4. B
5. C	6. D	7. C	8. A
9. B	10. D	11. A	12. C
13. C	14. D	15. D	16. B
17. A	18. D	19. C	20. D
21. C	22. D	23. C	24. B
25. C	26. B	27. D	28. A
29. B	30. C	31. D	32. A
33. B	34. C	35. D	36. A
37. D	38. A	39. D	40. B
41. B	42. A	43. C	44. B
45. C	46. D	47. C	48. A
49. B	50. D	51. A	52. C
53. C	54. D	55. D	56. B
57. C	58. C	59. A	60. D
61. A	62. B	63. C	64. A
65. D			

Part Three: INORGANIC CHEMISTRY 149

3.1. PERIODIC CLASSIFICATION OF ELEMENTS AND PERIODICITY OF PROPERTIES

1. Which of the following is a periodic property?
(A) Atomic volunme
(B) Metallic character
(C) Ionization energy
(D) All above

2. Law of octaves was proposed by
(A) Lothar Meyer (B) D.I. Mendeleev
(C) J.A.R. Newlands
(D) J.W. Dobereiner.

3. The atomic mass of the middle element is the average of the atomic masses of other two elements. This is a statement of
(A) Lothar Meyer
(B) A.E. de Chancourtois
(C) Newlands (D) Dobereiner.

4. In the Mendeleev's periodic table, elements are arranged in the increasing order of their
(A) Numbers of neutrons
(B) Atomic number
(C) Atomic weight
(D) Atomic volume.

5. The law of triads was proposed by
(A) Dobereiner (B) Newlands
(C) Lothar Meyer (D) Chancourtois.

6. Lothar Meyer plotted a graph showing variation of
(A) Atomic volume with increase in atomic number
(B) Atomic volume with increase in atomic weight
(C) Atomic radii with increase in atomic weight
(D) Atomic weight with increase in atomic number.

7. Which of the following remains unchanged on descending a group in the periodic table?
(A) Metallic character
(B) Density (C) Atomic size
(D) Valence electrons

8. Which of the following has largest size?
(A) Na^+ (B) Cl^-
(C) F^- (D) S^{2-}

9. In the long form of periodic table, elements are arranged according to
(A) Increasing atomic number
(B) Decreasing atomic number
(C) Increasing atomic mass
(D) Decreasing atomic mass.

10. Elements in the same vertical group of the periodic table have same
(A) Number of electrons
(B) Atomic number
(C) Number of valence elections
(D) Electronic configurations.

11. Which group contains elements that exist as monoatomic molecules?
(A) 1 (B) 2
(C) 14 (D) 18.

12. An element with atomic number 20 is placed in which period of the periodic table?
(A) 4 (B) 3
(C) 2 (D) 1.

13. Which of the follows has highest melting point?
(A) NaCl (B) LiCl
(C) KCl (D) RbCl

14. With reference to periodic table, which of the following does not belong to the set of magic numbers?
(A) 8 (B) 18
(C) 20 (D) 32.

15. The number of elements in each of the long periods of periodic table is
(A) 32 (B) 18
(C) 8 (D) 36.

16. Lanthanum is a member of
(A) s-Block (B) p-Block
(C) d-Block (D) f-Block.

17. Which block of the periodic table contains maximum number of metals?
(A) s-Block (B) p-Block
(C) d-Block (D)f-Block.

18. The element having electronic configuration [Kr] $4d^{10}, 4f^{14}, 5s^2, 5p^6, 5d^1, 6s^2$ belongs to
(A) s-Block (B) p-Block
(C) d-Block (D) f-Block.

19. In the modern periodic table, the period indicates the value of
(A) Atomic number
(B) Atomic mass
(C) Principal quantum number
(D) Azimuthal quantum number.

20. Which of the following elements is more metallic?
(A) P (B) As
(C) Sb (D) Bi

21. Which of the following is a typical element?
(A) Li (B) Na
(C) F (D) N.

22. Which of the following is a bridge element?
(A) Be (B) Cl
(C) K (D) P.

23. Which one of the following periodic groups consists entirely of metals?
(A) IIA (B) 111A
(C) V1IA (D) 0.

24. Which one of the following groups consists entirely of non-metals?
(A) IIA (B) IV A
(C) VIA (D) VIIA.

25. Which of the following ions has the highest value of ionic radius?
(A) Li^+ (B) B^{3+}
(C) F^- (D) O^{2-}

26. The element radium belongs to
(A) Actinide series
(B) Lanthanide series
(C) Alkaline-earth metals
(D) Chalcogens.

27. Which of the following elements does not form any compound?
(A) Neon (B) Krypton
(C) Xenon
(D) All of them form no compound.

28. Lithium and magnesium exhibit diagonal relationship because they have similar
(A) Ionic radii (B) Atomic radii
(C) Polarizing power
(D) Atomic volume.

29. The element whose electronic configuration is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2$ is a
(A) Metal (B) Non-metal
(C) Noble gas (D) Metalloid.

30. Which period of the periodic table is the longest?
(A) Fourth (B) Seventh
(C) Sixth (D) Fifth.

31. Chalcogens are elements of group
(A) 14 (B) 15
(C) 16 (D) 13.

32. Which of the following is a chalcogen?
(A) Sulphur
(B) Selenium
(C) Tellurium
(D) All are chalcogens

33. Which of the following sets of elements does not belong to same group?
(A) C, Si, Ga, Sn (B) Cl, Br, I, At
(C) N, P, As, Sb (D) He, Ne, Ar, Kr.

34. An element with half-filled 4p subshell belongs to which group
(A) 14 (B) 15
(C) 13 (D)16.

35. Which electronic configuration is that of elements of group 13 of the periodic table?
(A) $1s^2, 2s^2, 2p^3$ (B) $1s^2, 2s^2, 2p^1$
(C) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$
(D) $1s^2, 2s^2, 2p^4$

36. Main block elements are same as that of
(A) s-block (B) p-block
(C) s and p-block (D) d-block.

37. An element with atomic number 82 belongs to group
(A) 16 (B) 12
(C) 14 (D) 2.

38. An element with atomic number 39 belongs to
(A) Fourth period (B) Fifth period
(C) Third period (D) Sixth period.

39. In a period, the element with largest atomic volume belongs to
(A) Group 1 (B) Group 2
(C) Group 17 (D) Group 18.

40. As we go from left to right in Period 3, the gram atomic volume of the elements
(A) Increases regularly
(B) Decreases regularly
(C) First decreases and then increases
(D) Remains almost constant.

41. Which of the following sets of elements would have nearly same atomic radii?
(A) Na, K, Rb, Cs (B) Na, Mg, Al, Si
(C) Fe, Co, Ni, Cu (D) F, CI, Br, I.

42. Which of the following ions has smaller ionic radius?
(A) K^+ (B) Ca^{2+}
(C) Ti^{3+} (D) T^{4+}

43. Be^{2+} is isoelectronic with
(A) Mg^{2+} (B) Na^+
(C) Li^+ (D) H^+

44. In graph of atomic volume versus atomic weight, the elements corresponding to peaks in the curve belong to
(A) Group 1 (B) Group 18
(C) Group 4 (D) Group 14.

45. The correct order of ionic radii for the following ions is
(A) $S^{2-} < P^{3-} < CI^- < K^+$
(B) $CI^- > S^{2-} > P^{3-} > K^+$
(D) $K^+ > Cl^- > S^{2-} > P^{3-}$
(D) $P^{3-} > S^{2-} > CI^- > K^+$.

46. Atomic volumes of C, N, O and F are in the order
(A) C>N>F>O (B) C > N > O > F
(C) F > O > N > C (D) N > C > O > F.

47. The ions Sc^{3+}, Ca^{2+} and K^+ have same electronic configuration as that of
(A) Neon (B) Argon
(C) Krypton (D) Xenon.

48. Which of the following ions is smallest in size?
(A) F^- (B) Cl^-
(C) Br^- (D) I^-

49. Which of the following has least tendency to form unipositive ions in the gaseous state?
(A) I (B) Cl
(C) Br (D) F

50. Which of the following element is most electropositive?
(A) Li (B) Be
(C) B (D) C

51. Which of the following ions does not have the electronic configuration same as that of neon?
(A) F^- (B) O^{2-}
(C) Na^+ (D) Ca^{2+}

52. Which of the following represents the correct order of ionic radii?
(A) $Li^+ < Na^+ < K^+ < Rb^+$
(B) $Li^+ > Na^+ > K^+ > Rb^+$
(C) $Li^+ = Na^+ = K^+ = Rb^+$
(D) $Rb^+ > Na^+ > K^+ > Li^+$.

53. Which of the following is strong reducing agent in aqueous solution?
(A) Na (B) K
(C) Li (D) Cs

54. Which of the following oxides is most acidic?
(A) CO_2 (B) CO
(C) BeO (D) N_2O_5

55. Which of the following elements would have the lowest first ionization energy (IEj) ?
(A) Mg (B) Rb
(C) Li (D) Ca

56. The decreasing order of the second ionization energies of K, Ca and Ba is
(A) K>Ca>Ba (B) Ca>Ba>K
(C) Ba>K>Ca (D) K>Ba>Ca

57. Which of the following has highest electron affinity?
(A) Na^+ (B) O
(C) F^- (D) O^-

58. The one with largest size is
(A) Cl (B) Cl^+
(C) Cl^- (D) Cl^{3+}

59. Which of the following iso-electronic species has the highest IE?
(A) Ne (B) F^-
(C) O^{2-} (D) Na^+

60. Which of the following iso-electronic ions would require least energy for the removal of electron?
(A) Ca^{2+} (B) Cl^-
(C) K^+ (d) Ar

61. The ionization energy of N is more than that of oxygen because
(A) Nitrogen has half-filled p-orbitals
(B) Nitrogen atom is smaller in size than oxygen atom
(C) Nitrogen contains less number of electrons
(D) Nitrogen is less electronegative

62. Highest ionization potential is shown by
(A) Alkali metals (B) Halogens
(C) Transition metals
(D) Inert gases

63. The element with highest electron affinity among halogens is
(A) F (B) I
(C) Br (D) Cl

64. The correct order of second ionization potential of carbon, nitrogen, oxygen and fluorine is
(A) C>N>O>F (B) O>N>F>C
(C) O> F > N > C (D) F >O>N >.C.

65. The element with the highest first ionization potential is
(A) Boron (B) Carbon
(C) Nitrogen (D) Oxygen.

66. Which of the following metals exhibits more than one oxidation state?
(A) Na (B) Al
(C) Mg (D) Fe

67. Which of the following has least electron affinity?
(A) Oxygen (B) Argon
(C) Boron (D) Nitrogen

68. Which of the following statements is not correct?
(A) The element with highest IE belongs to group 18
(B) In each period the element with lowest IE belongs to group 1.
(C) In each period the element with highest IE is a noble gas
(D) In the second period, as we move from left to right, ionization energy increases regularly

69. Which of the following generally increases on going from top to bottom in a group?
(A) Metallic character
(B) Electronegativity
(C) Oxidizing behavior
(D) Reducing behavior

70. Which of the following elements has the highest third ionization energy?
(A) Sodium (B) Magnesium
(C) Aluminum (D) Silicon

71. Be has diagonal relationship with
(A) Li (B) B
(C) Na (D) Al

72. Which of the following elements has the highest ionization energy?
(A) Na (B) Si
(C) Cl (D) Ar

73. The first ionization energy of Mg is lower than
(A) Na (B) Ca
(C) Be (D) Al

74. In a period, the element with highest electron affinity belongs to
(A) Group 1 (B) Group 2
(C) Group 17 (D) Group 18

75. The element with highest electron affinity belongs to
(A) Period 2, group 17
(B) Period 3, group 17
(C) Period 2, group 18
(D) Period 2, group 1

76. The magnitude of electron affinity depends on
(A) Atomic size (B) Nuclear charge
(C) Electronic configuration
(D) All the above.

77. The correct order of electron affinities of Si, P and CI is
(A) P > Si > Cl (B) CI > P > Si
(C) Cl >Si>P (D) Si > P > Cl

78. The correct order of electron affinities is
(A) Cl>Si>Na>Ar
(B) Si > Cl> Na > Ar
(C) Cl>Na>Si>Ar
(D) Cl> Si >Ar > Na

79. Electron affinities of halogens are in the order
(A) F>Cl>Br>I (B) Cl>F>Br>I
(C) Cl>Br>I>F (D) Cl>Br>F>I

80. Which of the follwing has largest ionic radius?
(A) Li^+ (B) Na^+
(C) Mg^{++} (D) HaHa

81. Ca^{++} ion is isoelectronic with
(A) Mg^{++} (B) Na^+
(C) Ar (D) Kr

82. Which of the following group shows highest ionization potential?
(A) Alkali metals
(B) Transition metals
(C) Halogens (D) Inert gases

83. Which of the following is most electronegative?
(A) Carbon (B) Silicon
(C) Lead (D) Tin

84. The element having highest electron affinity among halogens is
(A) F (B) Cl
(C) Br (D) I

85. Which of the following does not exhibit the periodicity in properties of an element?
(A) Atomic radius

(B) Ionization energy
(C) N/P ratio
(D) Electron affinity

86. Which of the following elements has properties like that of P?
(A) Se (B) Ge
(C) Sb (D) Te

87. The most electronegative element of the third period is
(A) F (B) P
(C) Br (D) Cl

88. The electronegativity of the following elements increases in the order
(A) C, N, Si, P (B) N, Si, C, P
(C) Si,P,C,N (D) P, Si, N, C.

89. Keeping in view the periodic law and periodic table,suggest which of the following elements should have maximum electronegative character.
(A) Oxygen (B) Nitrogen
(C) Fluorine (D) Astatine.

90. Electronegativity (according to Mulliken scale) is givenby
(A) Average of first and second ionisation energies
(B) Average of first and second electron affinities
(C) Average of ionisation energy and electron affinity
(D) None of the above.

91. The electronegativity of the following elements increases in the order
(A) F > CI >O> S (B) S > CI >O> F
(C) F >O> CI > S (D) Cl> F >O> S.

92. The electronegativities of C, N, O and F are in the order
(A) F>O>N>C (B) F >O> C > N
(C) C > N >O> F (D) C >O> N > F.

93. Which of the following is the strongest oxidizing agent?
(A) F_2 (B) I_2
(C) Br_2 (D) Cl_2

94. The variable valency is generally observed in case of
(A) Transition elements
(B) Inert gases
(C) Normal elements
(D) Non-metallic elements.

95. A property which gradually increases on moving down a group in the periodic table is
(A) Ionization enthalpy
(B) Electronegativity
(C) Electron affinity
(D) Atomic size.

96. Which of the following pairs shows diagonal relationship?
(A) Li and Mg (B) Na and K
(C) Zn and Cd (D) Li and Be

97. The element Uuu has atomic number
(A) 102 (B) 101
(C) 111 (D) 110.

98. An element having low IE and low EA is likely to belong to
(A) Group IA (B) Group IB
(C) Group VIIA (D) Group VIII.

99. Anything that influences the valence electrons will affect the chemistry of the element. Which of the following factors does not affect the valence shell?
(A) Valence principle quantum number (n)
(B) Nuclear charge (Z)
(C) Nuclear mass
(D) Number of core electrons.

100. A trend which is common to elements of both the group IA and group VIIA, on going from top to bottom
(A) Boiling point increases
(B) Electron affinity increases
(C) Oxidizing power increases
(D) Ionization energy decreases.

101. Beryllium has diagonal relationship with
(A) Li (B) B
(C) Na (D) Al.

102. Which of the following generally increases on going from top to bottom in a group?
(A) Metallic character
(B) Electronegativity
(C) Oxidizing behavior
(D) Reducing behavior.

103. Considering the elements B, Al, Mg and K, the correct order of their metallic character is:
(A) B > Al >Mg > K
(B) Al > Mg > B >K
(C) Mg > Al > K > B
(D) K > Mg > Al > B

104. Which of the following statements is not correct?
(A) Among halogens, oxidizing behavior increases down the group
(B) Among alkali metals, reducing character increases down the group
(C) Fluorine is the most electronegative element
(D) Lithium is the hardest metal among alkali metals.

105. Considering the elements B, C, N, F and Si, the correct order of their non-metallic character is:
(A) B>C>Si>N>F (B) Si>C>B>N>F
(C) F > N > C > B > Si
(D) F > N > C > Si > B

106. Periodic table has been divided into four blocks, which block contains highest elements?
(A) s (B) p
(C) d (D) f.

107. Which of the following is most basic?
(A) $Mg(OH)_2$ (B) $Ca(OH)_2$
(C) $Ba(OH)_2$ (D) $Sr(OH)_2$

108. Which one of the following pairs is chemically dissimilar?
(A) Na and K (B) Ba and Sr
(C) Zr and Hf (D) Ca and Zn.

109. Which of the following halides shows bridge type structure?
(A) NaCl (B) CCl_4
(C) $CaCl_2$ (D) $AlCl_3$

110. Which one of the following elements shows maximum oxidation state?
(A) P (B) Mn
(C) S (D) Cr

111. Which one of the following sets of elements has the strongest tendency to form positive ions in gaseous state?
(A) Li, Na, K (B) Be, Mg, Ca
(C) F, CI, Br (D) O, S, Se.

112. Which of the following is not amphoteric oxide?
(A) ZnO (B) Al_2O_3
(C) PbO (D) SO_2

113. Which of the following is the strongest base?
(A) NH_3 (B) PH_3
(C) AsH_3 (D) SbH_3

114. Which of the following elements is most electropositive?
(A) C (B) N
(C) Be (D) O.

115. Which of the following elements forms maximum number of compounds?
(A) Carbon (B) Silicon
(C) Hydrogen (D) Fluorine

116. The common oxidation state of lanthanides is?
(A) + 3 (B) + 2
(C) + 1 (D) + 4.

117. Which of the following has the greatest metallic character?
(A) Na (B) Mg
(C) Al (D) Si.

118. Which of the following carbonates decomposes at the highest temperature?
(A) $MgCO_3$ (B) $CaCO_3$
(C) $SrCO_3$ (D) $BaCO_3$

119. Which of the following is most soluble in water?
(A) $BaSO_4$ (B) $SrSO_4$
(C) $CaSO_4$ (D) $MgSO_4$

120. Which of the following hydroxides has the maximum solubility in water?
(A) $Mg(OH)_2$ (B) $Ca(OH)_2$
(C) $Sr(OH)_2$ (D) $Ba(OH)_2$

ANSWERS

1. D	2. C	3. D	4. C
5. A	6. B	7. D	8. D
9. A	10. C	11. D	12. A
13. A	14. C	15. B	16. C
17. C	18. D	19. C	20. D
21. B	22. A	23. A	24. D
25. D	26. C	27. A	28. C
29. A	30. C	31. C	32. D
33. A	34. B	35. B	36. C
37. C	38. B	39. A	40. C
41. C	42. D	43. C	44. A
45. D	46. C	47. B	48. A
49. D	50. A	51. D	52. A
53. C	54. D	55. B	56. A
57. A	58. C	59. D	60. B
61. A	62. D	63. D	64. C
65. C	66. D	67. B	68. D
69. A	70. B	71. D	72. D
73. C	74. C	75. B	76. D
77. C	78. A	79. B	80. D
81. C	82. D	83. A	84. B
85. C	86. C	87. D	88. C
89. C	90. C	91. C	92. A
93. A	94. A	95. D	96. A
97. A	98. A	99. C	100. D
101. D	102. A	103. D	104. A
105. C	106. C	107. C	108. D
109. D	110. B	111. A	112. D
113. A	114. C	115. C	116. A
117. A	118. D	119. D	120. D

3.2. CHEMICAL BONDING

1 Which of the following compound does not following octet rule?
(A) CS_2 (B) PBr_3
(C) IBr (D) BrF_5

2. Which compound among the following does not contain an ionic bond?
(A) NaOH (B) HC1
(C) K_2S (D) LiH.

3 Which of the following will exhibit variableelectro-valency due to inert pair effect?
(A) Fe (B) Sn
(C) K
(D) Both Fe and Sn.

4. Among the solvents given below, with dielectric constant (E) given in parentheses which has highest solubility of KC1?
(A) Benzene (E = 0)
(B) Carbon disulphide (E = 0)
(C) Methanol (E =32)
(D) Acetone (E = 2).

5. Which of the following has the highest melting point?
(A) NaCl (B)KCl
(C) MgO (D) BaO.

6. Which of the following halide has lowest melting spoint ?
(A) NaCl (B) NaF
(C) NaBr (D) Nal.

7. Ionic reactions mainly take place in
(A) Aqueous solutions and organic solvents of high polarity
(B) Non-aqueous solvents of low polarity
(C) Gaseous state
(D) Solid state

8. Solid sodium chloride does not conduct electricity be-cause
(A) In solid NaCl, no ions are present
(B) Solid NaCl is covalent in nature
(C) In solid NaCl, there is no mobility of ions
(D) In solid NaCl, there are no electrons,

9. Ionic compounds in general possess both
(A) High melting point and non-directional bonds
(B) High melting points and low-boiling points
(C) Directional bonds and low-boiling points
(D) High solubility in polar and non-polar bonds.

10. The electronic configurations of sodium (Z=11)
(A) $ls^2 2s^2 2p^4$
(B) $ls^2 2s^2 2p^6 3s^2 2p^5$
(C) $ls^2 2s^2 2p^6 3s^1$, (D) $ls^2 2s^2 2p^6 3s^2$.

11. Among sodium phosphate, sodium sulphate and sodium chloride the solubility in water increases as
(A) Chloride > Phosphate > Sulphate
(B) Sulphate > Phosphate > Chloride
(C) Chloride > Sulphate > Phosphate
(D) Phosphate > Chloride > Sulphate.

12. The carbonate of which of the following will have highest lattice energy?
(A) Barium (B) Magnesium
(C) Calcium (D) Strontium.

13. Which of the following parameter is not involved in calculations based on Born Haber Cycle?
(A) Ionisation enthalpy
(B) Electron gain enthalpy
(C) Electronegativity
(D) Bond dissociation energy.

14. Which halide of ceasium will be highly ionic innature?
(A) Bromide (B) Fluoride
(C) Chloride (D) Iodide

15. Which of the following positive ion will cause maximum polarisation of cyanide ion?
(A) K^+ (B) Ag^+
(C) Rb^+ (D) Cs^+.

16. The electrolysis of molten metal hydride will produce dihydrogen gas
(A) At cathode (B) At anode
(C) At both the electrodes
(D) At none of the electrodes.

17. Which element among the following cannot exhibit variable electrovalency?
(A) $_{29}Cu$ (B) $_{50}Sn$
(C) $_{25}Mn$ (D) $_{38}Sr$.

18. The forces responsible for dissolution of ionic compounds in water are
(A) Hydrogen bonds
(B) Ion-dipole forces (C) Ionic bonds
(D) Van der Waal forces.

19. Which of the following is an example of super octet molecule?
(A) $C1F_3$ (B) PCl_5
(C) IF_7 (D) All the three.

20. Pi bond is formed
(A) By the overlapping of atomic orbitals on internuclear axis
(B) By transference of electrons
(C) By sidewise overlapping to half filled p-orbitals
(D) By overlapping of s-orbitals with p-orbitals.

21. Which element out of the following can exhibit a maximum co-valency of seven?
(A) Chlorine (B) Sulphur
(C) Fluorine (D) Both CI and F.

22. Which of the following element has six electrons inthe valence shell but cannot exhibit a maximum covalency of six?
(A) Sulphur (B) Selenium
(C) Oxygen
(D) Both (A) and (B).

23. Which of the following is not a characteristic of covalent compounds?
(A) They have low melting and boiling points
(B) They ionize on dissolution in polar solvents
(C) Their molecules have definite geometry
(D) They are generally insoluble in water.

24. Which of the following statements is incorrect?
(A) Sodium hydride is ionic
(B) Beryllium chloride is covalent
(C) $CC1_4$ gives a white ppt. with $AgNO_3$ solution
(D) Bonds in NaCl are non-directional.

25. Which of the following statements is correct?
(A) A sigma bond is weaker than a pi bond
(B) There are four coordinate bonds in the Lewis structure of NH_4^+ ion.
(C) The covalent bond is directional in nature
(D) A single bond between the two atoms cannot be π bond.

26. In which of the following species the bonds are non-directional?
(C) NCl_3 (B) RbCl
(C) $BeCl_2$ (D) $BC1_3$.

27. The geometry of the molecule is primarily decidedby
(A) bond pairs around the central atom
(B) No. of Pi bonds around the central atom
(C) No. of bond pairs as well as lone pairs around the central atom
(D) No. of lone pairs on central atom.

28. In the formation of H_2O molecule, the oxygen atom makes use of
(A) 2p-orbitals
(B) sp-hybrid orbitals
(C) sp^2-hybrid orbitals
(D) sp^3-hybrid orbitals

29. Which of the following molecule does not contain the covalent bond between similar atoms ?
(A) N_2H_4 (B) F_2O_2
(C) H_2F_2 (D) H_2O_2.

30. A molecule MX_4 has a square planar shape. The number of non-bonding pairs of electrons around M is
(A) 2 (B) 1
(C) 3 (D) 0.

31. Which of the following gaseous molecule is non-linear?
(A) XeF_2 (B) HCN
(C) H_2O (D) BeF_2.

32. The geometry of IF_7 is
(A) Heptagonal
(B) Trigonal bipyramidal
(C) Pentagonal bipyramidal
(D) Icosehederal

33. Which of the following species has a linear shape?
(A) O_3 (B) I_3^-
(C) ClO_2 (D) SO_2

34. The bond formed by complete transfer of electrons from electropositive to more electronegative atom is called
(A) Ionic bond (B) Covalent bond
(C) Metallic bond
(D) Co-ordinate bond

35. A type of a chemical bond which is formed by the mutual sharing of electrons between combining atoms of the same or different elements is called
(A) Ionic bond (B) Covalent bond
(C) Coordinate covalent bond
(D) Metallic bond

36. The bond length is measured by
(A) X-ray diffraction
(B) Neutron diffraction
(C) Microwave spectroscopy
(D) All of above

37. The polarity of bonds can lead to polarity of molecules and affect
(A) Melting point (B) Boiling point
(C) Solubility (D) All of above

38. Which molecule have zero dipole moment
(A) CO_2 (B) BCl_3
(C) $ClCH_3$ (D) All above

39. Which of the following species has tetrahedral structure?
(A) SF_4 (B) XeF_4
(C) CCl_4 (D) NO_3^-

40. Valence bond theory is also called as
(A) Electron pair theory
(B) Band theory
(C) Electron gas theory
(D) Electron pool theory

41. A covalent bond which is formed between two atoms by the overlap of atomic orbitals along their axis is called
(A) Pi-bond (B) Sigma bond
(C) Polar bond (D) Non polar bond

42. BCl_3 is an example of hybridization
(A) sp (B) sp^2
(C) sp^3 (D) d^2sp^3

43. The bond angel of sp2 hybridization is
(A) 180° (B) 120°
(C) 109.5° (D) 160°

44. PCl_5 is an example of hybridization
(A) d sp^3 (B) d^2sp^3
(C) sp^2 (D) sp^3

45. d^2sp^3 is oriented in a manner
(A) Trigonal (B) Tetrahedral
(C) Octahedral
(D) Trigonal bipyramidal

46. The bond order gives the following valuable information
(A) Stability of the molecules or ions
(B) Bond dissociation energy and bond length
(C) Magnetic properties
(D) All of the above

47. The bond distance of O_2 molecule is
(A) 1.43 Å (B) 1.09 Å
(C) 1.21 Å (D) None of above

48. The bond order for BO molecule is
(A) 2.5 (B) 3.0
(C) 2.0 (D) 3.5

49. Example of Intra-molecular hydrogen bonding
(A) *O*-nitrophenol
(B) *O*-hydroxy benzaldehyde
(C) *O*-hydroxy benzoic acid
(D) All of the above

50. Example of intermolecular H-bonding is
(A) NH_3 and H_2O (B) HF
(C) CH_3COOH (D) All of above

51. In order to understand the nature of H-bond, the theory has been suggested.
(A) Electrostatic approach
(B) Molecular orbital approach
(C) Valence bond approach
(D) All the above approaches

52. Hydrogen bond is not electrostatic in nature is stated by
(A) Electrostatic approach
(B) Valence bond approach
(C) Molecular orbital approach
(D) None of the above

53. H-bond has more energy than the van der Waals forces i.e.
(A) 1.0 kcal/mole (B) 2.0 k cal/mole
(C) 10.0 kcal/mole (D) 20.0 kcal mole

54. H-bond has a preferred bonding direction like
(A) Ionic bond (B) Covalent bond
(C) Coordinate bond
(D) None of them

55. H-bonding also exist in living system like
(A) Protein (B) DNA
(C) Both A and B (D) None of above

56. Metals are generally elements
(A) Electronegative
(B) Electropositive
(C) Neutral (D) None of above

57. Metals are
(A) Transparent (B) Translucant
(C) Opaque (D) None of above

58. Electron gas theory is able to explain
(A) Metallic lusture and optical properties
(B) Malleability and ductility
(C) High electrical and thermal conductivity
(D) All of the above

59. Electron gas theory fails to explain
(A) Specific heat of metals
(B) Electrical and thermal conductivity
(C) Paramagnetic behavior of metals
(D) All of the above

60. Metallic bond is treated essentially as in character
(A) Ionic (B) Covalent
(C) Polar (D) Non polar

61. Which of the following molecues has linear geometry?
(A) XeF_2 (B) BeF_2
(C) $AgCl_2$ (D) All of above

62. CCl_4 has zero dipole moment because of
(A) Planar structure
(B) Tetrahedral structure
(C) Similar size of C and Cl atoms
(D) Similar electrons affinity of C and Cl

63. Which of the following properties is associated with the covalent nature of the compound?
(A) It conducts electricity in molten state or aqueous state
(B) It is a non-electrolyte
(C) It has high m.p.
(D) It is a compound of a metal and non-metal

64. Which one has a co-ordinate bond?
(A) Al_2Cl_6 (B) BF_3
(C) NaCl (D) O_2

65. The type of bonding in HCl is
(A) Pure covalent (B) Polar covalent
(C) Highly polar
(D) Hydrogen bonding

66. Which of the following ahs non-zero dipole moment?
(A) NH_3 (B) SF_6
(C) BF_3 (D) CO_2

67. Which one of the following does not exhibit paramagnetism?
(A) NO (B) NO_2
(C) ClO_2 (D) ClO_2^-

68. The state of hybridization of carbon in CO_2 is
(A) sp^2 (B) sp^3
(C) sp (D) dsp^2

69. The percentage of s-character in the hybrid orbitals sp, sp^2 and sp^3 follows the pattern:
(A) $sp^3 > sp^2 > sp$ (B) $sp > sp^2 > sp^3$
(C) $sp = sp^2 > sp^3$ (D) $sp = sp^2 = sp^3$

70. NH_3 has a net dipole moment; while BF_3 has zero dipole moment. This is because
(A) NH_3 is not a planar molecule; while BF_3 is a planar molecule
(B) NH_3 is a planar molecule; while BF_3 is a planar molecule
(C) Fluorine is more electronegative than nitrogen
(D) Boron is more electronegative than nitrogen

71. In which of the following compounds does hydrogen bonding occur?
(A) CCl_4 (B) NaH
(C) HI (D) NH_3

72. Which of the following bonds will be non-polar?
(A) N—H (B) O—H
(C) C—H (D) Cl—Cl

73. The pair of molecules or ions having identical geometry is
(A) BCl_3, PCl_3 (D) BF_3, NH_3
(C) $CHCl_3$, CCl_4 (D) $SiCl_4$, CCl_4

74. Among LiCl, $BeCl_2$, BCl_3 and CCl_4, the covalent bond character follows the order:
(A) LiCl < $BeCl_2$ > BCl_3 > CCl_4
(B) LiCl > $BeCl_2$ < BCl_3 < CCl_4
(C) LiCl < $BeCl_2$ < BCl_3 < CCl_4
(D) LiCl > $BeCl_2$ > BCl_3 > CCl_4

75. Bond angle is minimum in
(A) H_2O (B) CO_2
(C) NH_3 (D) CH_4

76. An sp^3 hybrid orbital contains
(A) 1/4 s character (B) 1/2 s character
(C) 2/3 s character (D) 3/4 s character

77. Strength of H-bond is intermediate between
(A) Van der Waals forces and covalent bond
(B) Ionic and covalent bond

(C) Ionic and metallic bond
(D) Metallic and covalent

78. Which of the following does not apply to metallic bond?
(A) Overlapping valence orbitals
(B) Mobile valency electron
(C) Delocalized electrons
(D) Highly directed bonds

79. Which of the following in planar?
(A) CH_3Cl (B) $CHCl_3$
(C) CCl_4 (D) C_2H_2

80. Of the molecules, SF_4, XeF_4 and CF_4, which has square planar geometry?
(A) SF_4, XeF_4 and CF_4
(B) SF_4 only (C) CF_4 only
(D) XeF_4

81. Which one of following is paramagnetic and has the bond order equal to 0.5?
(A) N_2 (B) H_2^+
(C) F_2 (D) O_2

82. The order in O_2^+ is
(A) 1.0 (B) 1.5
(C) 2.0 (D) 2.5

83. Which of the following species is most stable?
(A) He_2 (B) H_2^+
(C) He_2^+ (D) H_2

84. Which of the following have identical bond order?
(A) CN^- and O_2^- (B) CN^- and NO^+
(C) O_2^- and CN^+ (D) NO^+ and CN^+

85. Which of the following molecule is paramagnetc in nature?
(A) F_2 (B) N_2
(C) H_2 (D) O_2

86. Co-ordinate covalent found is formed by the
(A) Transference of electrons
(B) Sharing of electrons
(C) Donation of electrons
(D) None of these

87. Which of the following species is diamagnetic in nature?
(A) O_2^+ (B) NO^+
(C) NO (D) O_2

88. Which one of the following has a linear structure?
(A) H_2O (B) CO_2
(C) NO_2^- (D) SO_2

89. Which of the following bonds between carbon-carbon is the strongest?
(A) Sigma bond (B) Pi-bond
(C) Double bond (D) Triple bond

90. The hydrogen bond is strongest in
(A) O—H......S (B) S—H......O
(C) F—H......F (D) F—H......O

91. The hybridisation of sulphur in sulphur dioxide is
(A) sp (B) sp^3
(C) sp^2 (D) dsp^2

92. On hydridization of one s and one p orbitals we get
(A) Two mutually perpendicular orbitals
(B) Two orbitals at 180°
(C) Four orbitals directed tetrahedrally
(D) Three orbitals in a plane

93. The bond angel around O atom in ice is close to
(A) 60° (B) 120°
(C) 90° (D) 105°

94. The ion that is isoelectronic with CO is
(A) CN^- B. O_2^+
(C) CO_2^- (D) N_2^+

95. The bond order of NO molecule is
(A) 1.5 (B) 2
(C) 2.5 (D) 3

96. The correct order of increasing polar character is
(A) $H_2O < NH_3 < H_2S < HF$
(B) $H_2S < NH_3 < H_2O < HF$
(C) $NH_3 < H_2O < HF < H_2O$
(D) $HF < H_2O < NH_3 < H_2S$

97. Which one of following is non-polar?
(A) CH_2Cl_2 (B) CCl_4
(C) $CHCl_3$ (D) CH_3Cl

98. The interactions (intermolecular forces) in HF are
(A) dipole-dipole interasctions
(B) hydrogen bonds
(C) dipole-dipole and dispersion forces
(D) hydrogen bond and dispersin forces

99. Strongest intermolecular hydrogen bond is formed in:
(A) H_2O (B) NH_3
(C) HF (D) H_2S

100. The attraction which exists between carbon dioxide molecules in solid carbon dioxide (or dry ice) is due to
(A) Van der Waal's forces
(B) Molecule-ion forces
(C) Ionic bonds
(D) Hydrogen bonds

101. The dipole moments of the given species are such that
(A) $BF_3 > NF_3 > NH_3$
(B) $NF_3 > BF_3 > NH_3$
(C) $NH_3 > NF_3 > BF_3$
(D) $NH_3 > BF_3 > NF_3$

102. Which of the following contains both covalent and ionic bond?
(A) CCl_4 (B) NH_4Cl
(C) $CaCl_2$ (D) H_2O

103. The shape of SO_4^{2-} ion is
(A) Tetrahedral (B) Square planar
(C) Trigonal planar
(D) Octahedral

104. Which one of the following is the correct order of interactions?
(A) Covalent < hydrogen bonding < van der Waal's < dipole-dipole
(B) Van der Waal's < hydrogen bonding < dipole-dipole < covalent
(C) Van der Waal's < dipole-dipole < hydrogen bonding < covalent
(D) Dipole-dipole < van der Waal's < hydrogen bonding < covalent

105. Valence bond theory was put forward by
(A) Pauling and Slatter
(B) Heitler and London
(C) Lewis (D) Pauli

106. According to the VSEPR theory, the shape of the SO_3 molecule is
(A) Pyramidal (B) Tetrahedral
(C) Trigonal planar
(D) Distorted tetrahedron

107. Which of the following statements is wrong?
(A) Covalent compounds are generally soluble is polar solvents
(B) Covalent compounds have low melting and boiling points
(C) Ionic solids do not conduct electricity is solid state
(D) Ionic compounds conduct electricity in the fused state

108. Arrange the following in order of increasing boiling point:
(A) $CH_3OH < CH_3Cl < RbCl < CH_4$
(B) $CHOH < CH_4 < CH_3Cl < RbCl$
(C) $RbCl < CH_3Cl < CH_3OH < CH_4$
(D) $CH_4 < CH_3Cl < CH_3OH < RbCl$

109. The maximum covalence of an element equal to
(A). The number of unpaired d electrons
(B) The number of paired p electrons
(C) The number of unpaired s and p electrons
(D) The actual number of s and p electrons in the outermost shell

110. How many sigma and pi bonds are there in a CO_2 molecule?
(A) 2 sigma
(B) 2 sigma and 4 pi
(C) 2 sigma and 2pi
(D) 4 sigma and no pi

111. Which of the following process involves the breaking of covalent bonds?
(A) Evaporation of water
(B) Melting of ice
(C) Formation of atomic chlorine
(D) Sublimation of iodine

112. Which of the following compounds has central atom as sp^2 hybridized?
(A) CO_2 (B) SO_3
(C) CO (D) N_2O

113. Which of the following molecule is not linear?
(A) CO_2 (B) SO_2
(C) CO (D) HCN

114. Which of the following molecule has bond angle of 120°?
(A) CO_2 (B) BF_3
(C) NH_3 (D) CH_4

115. The sahpe of $SnCl_2$ molecule is
(A) Linear (B) Angulat
(C) Trigonal planar
(D) Tetradedral

116. Which of the following solids does not contain covalent bond?
(A) Copper (B) Ice
(C) Diamond (D) Graphite

117. Which of the following molecules has unpaired electrons in antibonding molecular orbitas?
(A) O_2 (B) F_2
(C) B_2 (D) N_2

118. Carbon atom in acetylene is ——— hybridized?
(A) sp2 (B) sp
(C) sp3 (D) dsp2

119. The number of unpaired electrons in PH_3 is
(A) 0 (B) 1
(C) 2 (D) 3

120. Which of the following molecules is sphybridized?
(A) C_2H_4 (B) $BeCl_2$
(C) BF_3 (D) None of above

ANSWERS

1. D	2. C	3. B	4. C
5. C	6. D	7. A	8. C
9. C	10. C	11. C	12. B
13. C	14. B	15. B	16. B
17. D	18. B	19. D	20. C
21. A	22. C	23. B	24. C
25. D	26. B	27. C	28. D
29. C	30. A	31. C	32. C
33. B	34. B	35. B	36. D
37. D	38. A	39. C	40. A
41. B	42. B	43. B	44. A
45. C	46. D	47. C	48. A
49. D	50. D	51. D	52. B
53. A	54. B	55. C	56. D
57. C	58. D	59. D	60. B
61. D	62. B	63. B	64. A
65. B	66. D	67. D	68. C
69. B	70. A	71. D	72. D
73. D	74. C	75. A	76. A
77. A	78. D	79. D	80. D
81. B	82. D	83. D	84. B
85. D	86. C	87. B	88. B
89. D	90. C	91. C	92. B
93. D	94. A	95. C	96. B
97. B	98. D	99. C	100. A
101. C	102. B	103. A	104. C
105. B	106. C	107. A	108. D
109. D	110. C	111. C	112. B
113. B	114. B	115. B	116. A
117. A	118. B	119. B	120. B

3.3. ACIDS AND BASES

1. "Acids are substances whose aqueous solutions turned blue litmus red and tasted sour" stated by
   (A) Davy (B) Liebig
   (C) Boyle (D) Rouelle

2. Arrhenius concept explained
   (A) Constant heat of neutralization
   (B) Quantitative determination of acid / base strength
   (C) Catalytic property of acid
   (D) All above

3. Which of the following concept is also known as proton-donor acceptor system
   (A) Bronsted-Lowery
   (B) Lewis (C) Lux-Flood
   (D) Usanovich

4. Which of the following concept is also known as electron pair-donor acceptor system
   (A) Bronsted-Lowery
   (B) Lewis (C) Lux-Flood
   (D) Usanovich

5. Bases and reducing agents are electron-giving agents and also called as
   (A) Electrodotic (B) Electrophile
   (C) Nucleophile (D) None of above

6. Lewis concept explain the formation of
   (A) Ionic bond (B) Covalent bond
   (C) Co-ordinate bond
   (D) Chemical bond

7. Lux-Flood concept is a dono-acceptor system of
   (A) Proton (B) Electron pair
   (C) Neutron (D) Oxide ion

8. According to Usanovich concept a base is defined as any species
   (A) Capable of giving up anions
   (B) Combining with cations
   (C) Neutralizing an acid to give a salt
   (D) All of above

9. According to SHAB, Lewis acid are divided into
   (A) Two classes (B) Three classes
   (C) Four classes (D) None of above

10. According to SHAB concept the Lewis bases were classified on the basis of
    (A) Charge ion size
    (B) Polarization consideration
    (C) Electron and coordinating ability
    (D) All of above

11. The one in which the acceptor atom is of low positive charge, large size and has several outer electrons which can be easily excited is a
    (A) Soft Base (B) Hard Base
    (C) Soft Acid (D) Hard Acid

12. All the strong acids have very close pKa value and they appear to have nearly equal strengths in aqueous solutions. The phenomenon is called as
    (A) Levelling effect
    (B) Differentiating effect
    (C) Levelling solvent
    (D) Differentiating solvent

13. Relative order of acidity of HF, HCl, HBr and HI acids is
    (A) HCl > HBr > HI > HF
    (B) HF > HCl > HBr > HI
    (C) HI > HBr > HCl > HF
    (D) HF > HI > HCl > HBr

14. Relative order of acidity of oxy acid
(A) $HClO > HClO_2 > HClO_3 > HClO_4$
(B) $HClO_4 > HClO_3 > HClO_2 > HClO$
(C) $HClO_3 > HClO_2 > HClO > HClO_4$
(D) $HClO_2 > HClO_4 > HClO_3 > HClO$

15. A chemical reaction resulting in a change in the electric charge on the reacting particles may be called as
(A) Add ion reaction
(B) Redox reaction
(C) Elimination reaction
(D) Chain reaction

16. pH of pure water at 25°C, $kw = 1 \times 10^{-4}$
(A) 0 (B) 7
(C) 14 (D) None of above

17. The ionic product equilibrium constant is
A. Ka B. Kb
C. Kc D. Kw

18. The value of kw increases with temperature because the ionization of water
(A) Decreses
(B) Remains consatnt
(C) Increases (D) None of above

19. The concentration of OH^- ions in a certain household ammonia solution is 0.0025. This ammonia solution is
(A) Basic (B) Acidic
(C) Neutral (D) None of above

20. The pH of the tears is
(A) 7.0 (B) 7.4
(C) 7.8 (D) 8.2

21. The pH of milk is
(A) 6.0 (B) 6.5
(C) 7.0 (D) 7.5

22. The pH of the 0.1 M HCl solution is
(A) 0.01 (B) 0.1
(C) 0.2 (D) 1

23. The pH of the 1 M HCl is
(A) 0 (B) 0.1
(C) 1 (D) 0.2

24. The sum of pH and pOH is equal to
A. 1 B. 13
C. 14 D. 2

25. The most convenient and has nearest approach to a universal pH measurement is
(A) pH strips (B) pH indicator
(C) The emf method
(D) The colorimetric

26. Buffer solution are used to
(A) Increase the pH
(B) Decrease the pH
(C) Resist the pH (D) None of above

27. A mixture of weak acid and its salt is
(A) Alkaline buffer (B) Acidic buffer
(C) Neutral buffer (D) All of above

28. Glass electrode cannot be used to measure the pH of pure
(A) Acetic acid (B) Ethyl alcohol
(C) Gelatin (D) All above

29. The pH value 4.2 is of
(A) Vinegar (B) Lemons
(C) Oranges (D) Tomatoes

30. If the pH of solution is 1, its pOH will be
(A) 13 (B) 11
(C) 9 (D) None of above

31. Which of the followingis not Lowery-Bronsted acid?
(A) HCl (B) H_2O
(C) HS^- (D) Cl^-

32. Which of the following is not Lowery-Bronsted Base?
(A) NH_3 (B) H_2O
(C) HS^- (D) Cl^-

33. Which of the following is not Lewis acid?
(A) HCl (B) BF_3
(C) $AlCl_3$ (D) Cl^-

34. Which of the following is not Lewis base?
(A) NH_3 (B) H_2O
(C) Prridine (D) BF_3

35. Which of the following is not base according to Lux-Flood concept?
(A) CaO (B) MgO
(C) PbO (D) SiO_2

36. Which of the following is not acid according to Lux-Flood concept?
(A) CaO (B) CO2
(C) SO_3 (D) SiO_2

37. Which of the following is not soft acid according SHAB concept?
(A) K^+ (B) Cu^+
(C) Ag+ (D) Au^+

38. Which of the following is not hard acid according SHAB concept?
(A) Cu^+ (B) Li^+
(C) K+ (D) Na^+

39. Which of the following is not soft base according SHAB concept?
(A) F^- (B) CN^-
(C) H^- (D) R^-

40. Which of the following is not hard base according SHAB concept?
(A) NH_3 (B) N_2H_4
(C) RNH_2 (D) I^-

ANSWERS

1. C	2. D	3. A	4. B
5. A	6. C	7. D	8. D
9. A	10. D	11. C	12. A
13. C	14. B	15. B	16. B
17. D	18. C	19. A	20. B
21. B	22. D	23. A	24. C
25. C	26. C	27. B	28. D
29. D	30. A	31. D	32. C
33. D	34. D	35. D	36. A
37. A	38. A	39. A	40. D

3.4. CHEMISTRY OF HYDROGEN, ALKALI AND ALKALINE EARTH METALS

1. In which of the following characteristics does hydrogen resemble halogens?
   (A) Hydrogen is the lightest gas
   (B) H atoms contains one electron each
   (C) Hydrogen forms ionic hydrides with alkali metals
   (D) Hydrogen has three isotopes.

2. In which property listed below hydrogen does not resemble alkali metals?
   (A) Tendency to form cation
   (B) Nature of oxide
   (C) Combination with halogens
   (D) Reducing character.

3. In which of the properties listed below hydrogen does not show resemblance with halogens.
   I. Electropositive character
   II. Electronegative character
   III. Neutral nature of H_2O
   IV. Atomicity.
   (A) I and III (B) I only
   (C) II and III (D) III and IV.

4. Which of the following gas is lightest?
   (A) Dihydrogen (B) Helium
   (C) Dinitrogen (D) Dioxygen.

5. According to recent views which is the correct representation of hydrated proton in aqueous solutions ?
   (A) H^+ (B) $H_9O_5^+$
   (C) $H_9O_4^+$ (D) H_3O^+.

6. Which isotope of hydrogen is/are radioactive in nature?
   (A) Protium and deuterium
   (B) Tritium only
   (C) Tritium and deuterium
   (D) Only deuterium.

7. In which of the following reactions does dihydrogen act as oxidising agent?
   (A) $Ca + H_2 \longrightarrow$ (B) $H_2 + O_2 \longrightarrow$
   (C) $H_2 + F_2 \longrightarrow$ (D) $CuO + H_2 \longrightarrow$

8. Which metal can produce dihydrogen gas by reaction with dil. H_2SO_4?
   (A) Ag (B) Cu
   (C) Fe (D) Pt.

9. Which type of elements form ionic hydrides?
   (A) Transition elements
   (B) Metalloids
   (C) Elements with high electronegativity
   (D) Elements with high electropositivity

10. The process of adsorption of hydrogen on palladium is known as
   (A) Syneresis (B) Occlusion
   (C) Diffusion (D) Erosion.

11. Hydrogen at the moment of its generation (newly born hydrogen) is generally called
   (A) Protium
   (B) Nascent hydrogen
   (C) Atomic hydrogen
   (D) Heavy hydrogen.

12. The three isotopes of hydrogen differ from one another in
   (A) Atomic number
   (B) Number of protons
   (C) Nuclear charge (D) Nuclear mass.

13. Aluminium reacts with boiling water to liberate dihydrogen gas along with the formation of
(A) Aluminium oxide
(B) Aluminium hydroxide
(C) Aluminium suboxide
(D) Aluminium superoxide.

14. Which of the following is an allotrope of hydrogen?
(A) o-H_2 (B) p-H_2
(C) both(A) and (B)
(D) None of these.

15. When steam is passed over red hot coke. The products formed is/are
(A) Hydrogen and carbon dioxide
(B) Mixture of hdyrogen and carbon monoxide
(C) Mixture of hydrogen and oxygen
(D) Heavy hydrogen.

16. The correct order of reactivity among; I (atomic hydrogen); II (Dihydrogen) and III (Nascent hydrogen) is
(A) I > II > III (B) I > III > II
(C) II > III > I (D) III > II > I

17. Which elements out of the following do not produce hydrogen on treatment with caustic soda?
(A) Zn (B) Mg
(C) Al (D) Sn

18. The metal which produces hydrogen on treatment with acid as well as caustic soda is
(A) Zn (B) Mg
(C) Fe (D) None of above

19. The structure of H_2O_2 is
(A) Planar (B) Non-planar
(C) Spherical (D) Linear

20. Water gas is a mixture of
(A) CO_2 and H_2 (B) CO and H_2
(C) CO_2 and H_2O (D) CO and N_2

21. Which of the following is not an alkali metal?
(A) Potassium (B) Francium
(C) Sodium (D) Strontium.

22. The lightest alkali metal is
(A) Lithium (B) Sodium
(C) Rubidium (D) Caesium.

23. The most abundant alkali metal is
(A) Potassium (B) Rubidium
(C) Sodium (D) Lithium.

24. The correct order of ionization energies of alkali metals is
(A) Li > Na > K > Rb
(B) Na > K > Rb > Li
(C) Rb > K > Na > Li
(D) Rb > K > Li > Na.

25. The alkali metal with highest melting point is
(A) K (B) Na
(C) Cs (D) Li.

26. Lithium shows diagonal relationship with
(A) Beryllium (B) Sodium
(C) Magnesium (D) Calcium.

27. Among alkali metals, the least metallic element is
(A) Li (B) Na
(C) Rb (D) Cs.

28. The colour imparted by lithium to the flame is
(A) Golden yellow (B) Grassy green
(C) Violet (D) Red.

29. The only oxidation state of alkali metals in their compounds is
(A) + 1 (B) + 2
(C) - 1 (D) 0.

30. The electronic configuration of Rb may be representedas
(A) [Ar] $4s^1$ (B) [Kr] $5s^1$
(C) [Xe] $6s^1$ (D) [Xe] $5s^1$.

31. Sodium metal cannot be stored under
(A) Hexane (B) Benzene
(C) Kerosene (D) Ethanol.

32. Potassium crystallizes in a body centred lattice. Hence, the

coordination number of potassium in potassium metal is
(A) 6 (B) 8
(C) 4 (D) 12.

33. Sodium reacts more vigorously than lithium because
(A) It is a metal
(B) It has higher atomic mass
(C) It is more electronegative
(D) It is more electropositive.

34. The alkali metal that reacts with nitrogen directly to form nitride is
(A) Na (B) K
(C) Rb (D) Li.

35. The most reactive alkali metal among the following is
(A) Li (B) Na
(C) Rb (D) Cs.

36. Potassium reacts with excess of oxygen to form
(A) K_2O (B) K_2O_2
(C) K_2O_3 (D) KO_2

37. Sodium reacts with excess of oxygen to form
(A) Na_2O (B) NaO_2
(C) Na_2O_2 (D) NaO.

38. Which among the following is insoluble in water?
(A) LiOH (B) NaOH
(C) KOH (D) RbOH.

39. Which among the following is least soluble in water?
(A) NaF (B) LiF
(C) KF (D) CsF.

40. Which of the following reacts with excess oxygen to form a normal oxide?
(A) Li (B) Na
(C) K (D) Rb.

41. Which of the following compounds liberates CO_2 on heating?
(A) Li_2CO_3 (B) Na_2CO_3
(C) K_2CO_3
(D) All liberate CO_2 on heating.

42. Which of the following is the weakest base?
(A) KOH (B) NaOH
(C) LiOH (D) RbOH.

43. Which of the following has the maximum tendency to form complexes?
(A) K (B) Rb
(C) Na (D) Li.

44. Baking powder has one of the following constituent
(A) NaOH (B) $NaHCO_3$
(C) KOH (D) Na_2CO_3

45. The formula of *nitre* is
(A) KNO_3 (B) $RbNO_3$
(C) $NaNO_3$ (D) $LiNO_3$

46. Which of the following elements has the highest melting point?
(A) Magnesium (B) Calcium
(C) Strontium (D) Beryllium.

47. Which of the following is the most abundant alkaline earth metal?
(A) Be (B) Mg
(C) Ca (D) Sr.

48. Which of the following alkaline earth metals occurs in radioactive form in nature?
(A) Ca (B) Mg
(C) Ba (D) Ra.

49. Which of the elements of groups IIA has the highest value of IE_1?
(A) Mg (B) Be
(C) Ca (D) Sr.

50. Which of the following is the strongest reducing agent?
(A) Be (B) Mg
(C) Ca (D) Sr.

51. Which of the following elements has the highest value of IE_1?
(A) Na (B) K
(C) Mg (D) Ca.

52. Metallic magnesium is obtained by
(A) Reduction of MgO with coke
(B) Electrolysis of an aqueous solution of $MgCl_2$
(C) Electrolysis of molten $MgCl_2$
(D) Displacement of magnesium by iron from $MgCl_2$ solution.

53. Which element, amongst the following, has the highest boiling point?
(A) Na (B) Mg
(C) Ca (D) K.

54. Drying agent which reacts with CO_2 and removes water vapors is
(A) CaO (B) $CaCl_2$
(C) $CaCO_3$ (D) $Ca(NO_3)_2$

55. Beryllium shows diagonal relationship with
(A) Mg (B) Na
(C) Al (D) B.

56. Dolomite is a mineral whose formula is
(A) $CaCO_3$ (B) $MgCO_3$
(C) $CaCO_3.MgCO_3$ (D) $CaSO_4$

57. Formula of gypsum is
(A) $CaSO_4$ (B) $CaSO_4.H_2O$
(C) $2CaSO_4.H_2O$ (D) $CaSiO_3$

58. Magnesium burns in air to give
(A) MgO (B) $MgCO_3$
(C) Mg_3N_2
(D) Both (A) and (C).

59. At high temperature nitrogen combines with calcium carbide to give
(A) Calcium cyanide
(B) Calcium cyanamide
(C) Calcium nitride
(D) Calcium carbonate.

60. The formula of bleaching powder is
(A) $CaOCl_2$ (B) $CaClO_3$
(C) $Ca(ClO_3)_2$ (D) CaOCl

61. Which of the following carbonates decomposes at the highest temperature?
(A) $MgCO_3$ (B) $CaCO_3$
(C) $SrCO_3$ (D) $BaCO_3$.

62. The wire of flash bulb is made up of
(A) Cu (B) Ag
(C) Mg (D) Ba.

63. Which of the following metals is the most abundantin the earth's crust ?
(A) Mg (B) Na
(C) Ca (D) K.

64. Of the following the commonly used in the laboratory desiccator is
(A) Anhyd. Na_2CO_3
(B) Anhyd. $CaCl_2$
(C) Dry NaCl (D) None of above.

65. Setting of Plaster of Paris involves
(A) Oxidation with atmospheric oxygen
(B) Combination with atmospheric CO_2
(C) Dehydration
(D) Hydration to yield another hydrate.

66. The most common oxidation state of alkaline earthmetals is
(A) + 1 (B) + 2
(C) −2 . (D) −1.

67. Which of the following elements has the highest density?
(A) Mg (B) Na
(C) K (D) Rb.

68. When calcium is heated in the flame of a Bunsen. sburner, the colour imparted to the flame is
(A) Golden yellow (B) Brick red
(C) Crimson red (D) Grassy green.

69. Which of the following elements with excess oxygen to form peroxides ?
(A) Ca (B) Mg
(C) Li (D) Ba.

70. Which of the following is not true as compared with alkaline earth metals
(A) Alkali metals are more reactive
(B) Alkali metals have lower density
(C) Alkali metals are more electropositive
(D) Alkali metals have stronger metallic bonds.

71. Which of the following oxides is amphoteric?
(A) CaO (B) BaO
(C) BeO (D) MgO.

72. Which of the following hydroxides is most stable?
(A) $Mg(OH)_2$ (B) $Ca(OH)_2$
(C) Sr(OH), (D) $Ba(OH)_2$.

73. Lime water is an aqueous solution of
(A) $MgSO_4$ (B) $Ca(OH)_2$
(C) $CaCO_3$ (D) $CaSO_4$

74. Which of the following elements does not impart any characteristic colour to the flame?
(A) Ca (B) Mg
(C) Ba (D) Sr.

75. Silvite is an ore of
(A) Ca (B) Mg
(C) Ba (D) K .

76. Barite is an ore of
(A) Ca (B) Mg
(C) Ba (D) K .

77. Magnesite is an ore of
(A) Ca (B) Mg
(C) Ba (D) K .

78. Calcite is an ore of
(A) Ca (B) Mg
(C) Ba (D) K .

79. Dolomite is an ore of
(A) Ca (B) Mg
(C) Ba
(D) Both Ca and Mg

80. Halite is a chemical name of
(A) KCl (B) NaCl
(C) $MgCl_2$ (D) $SrCl_2$

81. Mg is present in
(A) Ascorbic acid (B) Haemoglobin
(C) Vitamin E (D) chlorophyll.

82. The formula of Epsom salt is
(A) $CaSO_4.7H_2O$ (B) $SrSO_4.7H_2O$
(C) $BaSO_4.7H_2O$ (D) $MgSO_4.7H_2O$

83. The composition of Whetherite is
(A) $BaSO_4$ (B) $BaCO_3$
(C) $SrSO_4$ (D) None of above

84. Which element is evolved at the cathode during electrolysis of brine in the diaphram cell?
(A) Na (B) H_2
(C) Cl_2 (D) O_2

85. Down,s cell is used to prepare
(A) $BaSO_4$ (B) Na
(C) NaOH (D) $NaHCO_3$

86. Which is produced at cathode dusring the electrolysis of brine in Nelson,s cell?
(A) Na (B) H_2
(C) Cl_2 (D) O_2

87. Dolomite is acarbonate of
(A) Na and Ba (B) Ca and Mg
(C) K and Ca (D) Mg and Sr

ANSWERS

1. C	2. B	3. A	4. A
5. C	6. B	7. A	8. C
9. D	10. B	11. B	12. D
13. A	14. C	15. B	16. B
17. B	18. A	19. B	20. B
21. D	22. A	23. C	24. A
25. D	26. C	27. A	28. D
29. A	30. B	31. B	32. B
33. D	34. D	35. D	36. D
37. C	38. A	39. B	40. A
41. A	42. C	43. D	44. B
45. A	46. D	47. C	48. D
49. B	50. A	51. C	52. B
53. B	54. A	55. C	56. C
57. B	58. D	59. B	60. A
61. D	62. C	63. C	64. B
65. D	66. B	67. A	68. B
69. D	70. D	71. C	72. D
73. B	74. B	75. D	76. C
77. B	78. A	79. D	80. B
81. D	82. D	83. B	84. B
85. B	86. B	87. B	

3.5. CHEMISTRY OF BORON AND ALUMINUM

1. Group IIIA of the periodic table consist of elements
   (A) 3 (B) 4
   (C) 5 (D) 6
2. Which of the following is mineral of Al?
   A. Mica B. Feldspar
   C. Bauxite D. All above
3. All the member of group III A are metals except
   A. B B. Al
   C. Ga D. In
4. The valence shell electronic configuration of group III A is
   A. ns^1p^2 B. ns^2p^1
   C. ns^3p^2 D. ns^2p^2
5. Which of the following element givse violet colour to flame?
   A. Gallium B. Indium
   C. Thallium D. Aluminium
6. Which of the followings have +3 oxidation states
   A. B & Al B. In & Tl
   C. B & In D. Al & Tl
7. Which of the following forms electron deficient compounds
   A. B B. Al
   C. Both B & Al D. None of above
8. Which of the following areelements are typical non-metals?
   A. B & Al B. B & Si
   C. Al & Si D. All above
9. Which of the following pair of elements shows allotropy>
   A. B & Al B. B & Si
   C. Al & Si D. None of above
10. Which of the following are oxides ores of Aluminium?
    A. Corundum B. Bauxite
    C. Diaspore D. All above
11. Which of the following are sulphate ores of aluminium
    A. Alumite B. Cryolite
    C. Feldspar D. Kaolin
12. The formula of Bauxite is
    A. Al_2O_3 B. $Al_2O_3\ 2H_2O$
    C. $Al_2O_3\ H_2O$ D. $Na_3\ AlF_6$
13. The purification of Bauxite can be carried out
    A. Baeyer's process
    B. Hall's process
    C. Serpek's process
    D. Any of above
14. In the purification of bauxite, the ore is fused with sodium carbonate in the process
    A. Baeyer's process
    B. Hall's process
    C. Serpeck's process
    D. Any of above
15. Aluminium is used for
    A. Making ultensils & frames
    B. Making alloys
    C. Reducing agent
    D. All above
16. Magnalium is alloy of Aluminium which is used in
    A. Scientific apparatus
    B. Aircraft parts C. Rail road cars
    D. Boat machinery
17. The formula of hexa borane is
    A. $B_4\ H_{10}$ B. $B_6\ H_{10}$
    C. $B_5\ H_9$ D. $B_8\ H_{12}$

18. Is an inflammable colourless gas with a sticky sweet odour and is extremely toxic
A. B_2H_6 B. B_4H_{10}
C. B_5H_9 D. B_6H_{10}

19. Dibornae is used
A. For high energy fuel
B. For welding torches
C. As reducing agent
D. All above

20. The formula of Borax is
A. $Na_2B_4O_7 \cdot 6H_2O$
B. $Na_2B_4O_7 \cdot 8H_2O$
C. $Na_2B_4O_7 \cdot 10H_2O$
D. $Na_2B_4O_7 \cdot 12H_2O$

21. The formula of Tetraboric acid is
A. H_3BO_3 B. HBO_2
C. $H_2B_4O_7$ D. $H_6B_4O_9$

22. Boric acid is used
A. In manufacture of pottery glaze
B. In medicine as an antiseptic
C. In tanning industry
D. All above

23. Borax exists in the form
A. Ordinary borax
B. Octahedral borax
C. Borax glass
D. All above

24. The formula of borax glass is
A. $Na_2B_4O_7 \cdot 10H_2O$
B. $Na_2B_4O_7 \cdot 5H_2O$
C. NaB_4O_7 D. None of above

25. Sodium tetraborate is used
A. As alkaline buffer in dying & bleaching process
B. In manufacture of optical glass
C. In enameling and making glaze
D. All above

26. Aluminium halide is
A. White crystalline solid
B. Hygroscopic
C. Sublimes at 180°C
D. All above

27. $AlCl_3$ is used in
A. Manufacturing of petrol
B. In borax bead test
C. Preservation of food
D. All above

28. Which of the following reacts violently with water
A. AlH_3 B. $AlCl_3$
C. $LiAlH_4$ D. Al_2Cl_6

29. Boron exhibts diagonal realtionship with
A. Mg B. Ge
C. Al D. Si

30. Alums are generally used
A. In dyeing and water proofing of fabric
B. In arrest bleeding
C. In water purification
D. All above

31. Boron does not form B^{3+} ion because
A. It has small size and high ionization energy
B. It has high electronegativity
C. It has high charge density (charge/radius ratio)
D. None of the above

32. The aqueous solution of sodium silicate is
A. Acidic B. Amphoteric
C. Neutral D. Basic

33. $AlCl_3$ fumes in air because of
A. Hydrolysis B. Dehydration
C. Hydration D. Oxidation

34. Which of the following statements about anhydrous aluminum chloride is correct?
A. It exist as $AlCl_3$ molecules
B. It is not easily hydrolysed
C. It sublimes at 100°C under vacuum
D. Boron does not form B^{3+} ions

35. Which of the following statements is not true for both B and Al?
   A. They burn in oxygen to give oxides at high temperature
   B. Their halides are Lewis acids
   C. They combine with nitrogen to form nitrides
   D. They react with HCl to form chlorides

36. Amorphous boron on burning in air forms
   A. $B(OH)_3$ B. Only B_2O_3
   C. Only BN
   D. Mixture of B_2O_3 and BN

37. Concentrated aqueous sodium hydroxide can separate a mixture of
   A. Al^{3+} and Sn^{2+}
   B. Al^{3+} and Fe^{3+}
   C. Al^{3+} and Zn^{2+}
   D. Zn^{2+} and Pb^{2+}.

38. Hydrogen gas will not reduce
   A. Heated cupric oxide
   B. Heated ferric oxide
   C. Heated stannic oxide
   D. Heated aluminum oxide

39. The formula of chrome yellow is
   A. K_2CrO_4 B. $PbCrO_4$
   C. $K_2Cr_2O_7$ D. None of above

40. Tincal is a mineral of
   A. Al   B. B
   C. Si   D. Sr

41. In the aluminothermite process, aluminium acts as
   A. An oxidizing agent B. A flux
   C. A reducing agent D. A solder

42. When borax is strongly heated, it gives
   A. B_2O_3 B. $Na_2B_4O_7$
   C. $NaBO_2$ D. $NaBO_2 + B_2O_3$

43. When orthoboric acid is heated strongly, it gives
   A. B_2O_3 B. $H_2B_3O_7$
   C. HBO_2 D. B

44. Which of the following statements is not true about potash alum?
   A. Its empirical formula is $KAl(SO_4)_2 . 12H_2O$
   B. Its aqueous solution is basic in nature
   C. It is used in dyeing industry
   D. On heating, it melts in its water of crystallization.

45. Which one of the following statements regarding BF_3 is not correct?
   A. It is an ionic compound
   B. It is an electron-deficient compound
   C. It is a Lewis acid
   D. It forms adducts

46. Which librates H_2 with NaOH?
   A. B   B. Al
   C. Zn   D. All

47. The aluminium salt commonly used to stop bleeding is
   A. Aluminium sulphate
   B. Potash alum
   C. Aluminium chloride
   D. Aluminium fluoride

48. Pb_3O_4 has chemical name of
   A. Talc   B. Mica
   C. Sandhur   D. Epsom salt

49. In B_2H_6 molecule
   A. There exists a direct B-B σ-bond
   B. All the atoms are in one plane
   C. All the B-H bonds are normal covalent bonds
   D. There exist two (three-centre two-electron) bonds between the boron atoms.

50. The nature of borax solution is
   A. Acidic   B. Alkaline
   C. Neutral   D. Amphoteric

51. The most abundant metal in earth's crust is

A. Fe
B. Al
C. Ti
D. Ca

52. The element with maximum first ionization energy (or ionization potential) is

A. B
B. N
C. O
D. C

53. Aluminium does not corrode as does iron, because

A. Al does not react with O_2
B. A protective layer of Al_2O_3 forms on the metal surface
C. Al is harder to oxidize than is Fe
D. Fe gives cathodic protection to Al

54. Which of the following statement is incorrect?

A. An alloy is a mixture of two or more metals
B. An alloy is a mixture of two or more metal and non-metal elements that have metallic properties
C. An alloy has a fixed composition
D. An amalgam is an alloy containing Hg

55. The role of the mineral cryolite. Na_3AlF_6, in the Hall process for aluminum production is

A. It is the source of aluminum (the ore)
B. It is a chemical reducing agent
C. It forms a slag to remove impurities
D. In the molten state, it is a solvent for alumina, Al_2O_3

56. The Hall process involves the reduction of Al_2O_3 to aluminum by

A. Carbon (coke)
B. Carbon monoxide
C. Molecular hydrogen
D. Electrolysis

57. Aluminum is an active metal, but does not corrode as iron does because

A. Al does not react with O_2.
B. A protective layer of Al_2O_3 forms on the metal surface
C. Al is harder to oxidize than is Fe
D. Aluminium has a high tensile strength

58. Which of the following is not a property of aluminium?

A. An efficient electrical conductor
B. A low density compared to other metals
C. Is amphoteric
D. Toxic to humans

59. Aluminium hydroxide $Al(OH)_3$ is

A. An acid
B. An amphoteric hydroxide
C. A base
D. An explosive hydroxide

60. Boron and aluminum halides are electron-deficient compounds. In this respect, they act as

A. Lewis acid
B. Lewis base
C. Oxidizing agent
D Reducing agent

61. Which one of the following elements shows the most stable oxidation state of +1

A. Al
B. Ga
C. In
D. Tl

62. The compound which does not act as Lewis acid is

A. BF_3
B. $AlCl_3$
C. $BeCl_2$
D. $SnCl_4$

63. $AlCl_3$ acts as a strong Lewis acid, because it is

A. A covalent compound
B. Readily hydrolyzed
C. Electron-deficient
D. An ionic compound

64. Which of the following hydroxide is amphoteric?
A. $B(OH)_3$ B. $Al(OH)_3$
C. $Ga(OH)_3$ D. $In(OH)_3$

65. The chief ore of aluminium is
A. Cryolite B. Bauxite
C. Kaolin D. Carnalite

66. The chemical formula of bauxite is
A. Al_2O_3 B. Al_2Cl_6
C. $Al_2O_3 . 2H_2O$ D. Na_3AlF_6

67. Boric acid is added to glass, because it
A. Makes the glass opalescent
B. Reduces the coefficient of expansion
C. Makes the glass brittle
D. Increase refractive index of the glass

68. Which metal burns in air at high temperature with the evolution of much heat ?
A. Cu B. Hg
C. Pb D. Al

69. Which of the following is not an alum?
A. $KAl(SO_4)_2 \cdot 12H_2O$
B. $NaAl(SO_4)_2 \cdot 12H_2O$
C. $NH_4Fe(SO_4)_2 \cdot 12H_2O$
D. $FeAl(SO_4)_2 \cdot 12H_2O$

70. Duralumin is an alloy of
A. Mg + Al B. Al + Mg + Mn
C. Mg + Al + Cu
D. Mg + Al + Cu + Mn

71. Mangalium is an alloy of
A. Al + Mg B. Mg + Al + Mn
C. Mg + Al + Cu
D. Mg + Al + Cu + Mn

72. BCl_3 is a planar molecule, because B atom is
A. sp^2-hybridized B. sp^3-hybridized
C. sp-hybridized
D. sp^3d-hybridized

ANSWERS

1. C	2. D	3. A	4. B
5. A	6. A	7. C	8. B
9. B	10. D	11. A	12. B
13. D	14. B	15. D	16. A
17. B	18. A	19. D	20. C
21. C	22. D	23. D	24. C
25. D	26. D	27. A	28. C
29. D	30. D	31. A	32. D
33. A	34. A	35. D	36. D
37. B	38. D	39. B	40. B
41. C	42. D	43. A	44. B
45. A	46. D	47. B	48. C
49. D	50. D	51. B	52. B
53. B	54. C	55. D	56. D
57. B	58. D	59. B	60. A
61. D	62. C	63. C	64. B
65. B	66. C	67. B	68. D
69. D	70. D	71. A	72. A

3.6. CHEMISTRY OF CARBON AND SILICON

1. Group IV A consist of elements
   A. 3 B. 4
   C. 5 D. 6
2. Main constituent of all inorganic matter
   A. Carbon B. Silicon
   C. Tin D. Lead
3. The penultimate shell of carbon contains electrons
   A. s^2 B. s^2p^6
   C. $s^2p^6d^{10}$ D. $s^2p^6d^8$
4. Which oxide of carbon is useful in preparing metal carbonyl?
   A. CO B. CO_2
   C. C_3O_2 D. None of above
5. Which of the following properties shows a regular increase on moving down the group from carbon to lead (Group IV A)
   A. Atomic volume
   B. Atomic radius
   C. Density D. All above
6. Most electronegative element is
   A. C B. Si
   C. Pb D. Sn
7. Allotropic form of tin
   A. White tin B. Grey tin
   C. Rhombic tin D. All above
8. Which of the following element has maximum property of catenation?
   A. C B. Si
   C. Sn D. Pb
9. Tetra halides of which following elements do not undergo hydrolysis
   A. C B. Si
   C. Sn D. Pb
10. The gases that are responsible for green house effect are
    A. CO_2& CH_4 B. CFC
    C. N_2O D. All above
11. Which of the following green houses are responsible for keeping our plant warm and sustaining life on the earth
    A. CO_2 & water vapours
    B. CO_2 & CFC
    C. CO_2 & N_2O D. CO_2 & CH_4
12. During the last two centuries, the atmospheric CO_2 contents are increased by
    A. 15% B. 25%
    C. 35% D. 50%
13. The rising world temperature will have serious effect on
    A. Agriculture
    B. Animal production
    C. Human being D. All above
14. Types of carbides
    A. Ionic carides
    B. Covalnet carbides
    C. Interstitial carbides
    D. All above
15. Carbides because of their hardness are
    A. Ionic carbides
    B. Interstitial carbides
    C. Covalent carbides
    D. Any of above
16. Which of the following are used as water repellent?
    A. Carbides B. Silicon
    C. Silicones D. Silicates

17. Which of the following do not freeze at low temperature as −40°C and donot melt at 200°C
A. Carbides B. Silicon
C. Silicones D. Silicates

18. Hemimorphite is an example of
A. Orthosilicate B. Pyrosilicate
C. Cyclic silicate D. Meta silicate

19. Which of the following is a chain silicate?
A. Olivine B. Tremolite
C. Beryl D. Zeolite

20. Sodium silicate is used
A. In fire proofing of wood and textiles
B. As a preservative of eggs
C. As a furniture polish
D. All above

21. Sodium silicate is used
A. In the paint industry
B. For fixing labels to glass
C. In a soap industry
D. All above

22. In average composition of a good sample of cement the percentage of silica is
A. 18.5% B. 20.5%
C. 22.5% D. 24.5%

23. In manufacturing of cement crystallization of amorphous dehydration products of clay is
A. 500°C to 800°C
B. 900°C to 1200°C
C. 1250°C to 1400°C
D. 1000 to 1100°C

24. Setting of cement is improved by
A. Lime stone B. Clay
C. Gypsum D. Water

25. Any substance which has solidified from the liquid state with crystallization is known as ______
A. Steel B. Fibre
C. Glass D. Asbestos

26. Glass obtained by placing a layer of butyral plastic with a suitable adhesive between two layers of glass and cementing them by heat and pressure is called
A. Glass wool B. Safety glass
C. Optical glass D. Jena glass

27. The general trend in the properties of elements of carbon family shows that with increase in atomic number
A. The tendency towards catenation increases
B. The tendency to show +2 oxidation state increases
C. Metallic character decreases
D. The tendency to form complexes with covalency higher than four decreases.

28. The nature of bonds in compounds of carbon and silicon is mostly
A. covalent B. electrovalent
C. metallic
D. Both (A) and (B)

29. Graphite is a good conductor of electricity, because it
A. Has sp^2-hybridized carbon atoms
B. Has free electrons
C. is crystalline D. Has free atoms

30. Which of the following carbides reacts with H_2O to form propane?
A. Al_4C_3 B. CaC_2
C. SiC D. SiC

31. Which among the following is a false statement?
A. SiO_2 has a structure similar to that of CO_2
B. Natural Si exists only in the combined state
C. Si can be prepared by reducing SiO_2 with Mg
D. Si does not exist in graphite-like structure, but exists only in diamond-like structure

32. Which of the following oxides is neutral as well as toxic?
A. SnO B. PbO
C. CO_2 D. CO

33. Which of the following oxides is acidic and solid at room temperature?
A. CO_2 B. SiO_2
C. PbO_2 4. SnO_2

34. Which of tetrachloride is resistant to hydrolysis?
A. CCl_4 B. $SiCl_4$
C. $GeCl_4$ D. $SnCl_4$

35. Which of the following compounds would be most ionic in character?
A. $PbCl_4$ B. $PbCl_2$
C. $SnCl_4$ D. $SnCl_2$

36. Elements of group 14 have the electronic configuration of their outer shell as
A. $ns^2 np^2$ B. $ns^2 np^2$
C. $ns^2 np^6$ D. ns^2

37. Elements of group 14
A. Exhibit oxidation state of +3
B. Exhibit oxidation state of +4
C. Form M^{3+} and M^{4+} ions
D. Form M^{4-} and M^{4+} ions

38. Catenation is a process of
A. Formation of cations
B. Deposition of cations
C. Formation of long chain of identical atoms
D. Formation of covalent bond

39. The metallic character of group 14 elements
A. Decreases from top to bottom
B. Increases from top to bottom
C. Does not change gradually
D. Has no significance

40. Which of the bonds possesses highest bond energy?
A. C–C B. Si–Si
C. Ge–Ge D. Sn–Sn

41. Inert pair effect is best shown by
A. Si B. C
C. Sn D. Pb

42. The most stable oxidation state shown by lead is/are
A. +2, +4 B. +2 only
C. +3, +4 D. +4 only

43. Which of the following statements is not true for carbon?
A. Its forms compounds with multiple bonds
B. Its ionization energy is very high
C. It undergoes catenation
D. It shows inert pair effect

44. Which property is not exhibited by carbon in its compounds?
A. Forming bonds to other carbon atoms
B. Forming multiple forms
C. Exhibiting allotropic forms
D. Forming compounds with coordination number beyond four

45. Diamond and carbon are the ———— forms of carbon
A. Isotropic B. Amorphous
C. Allotropic D. Isomeric

46. The different layers in graphite are held together by
A. Ionic bonding B. Metallic bonding
C. Covalent bonding
D. van der Waals forces

47. Lead pencils contain
A. Lead B. Lead sulphide
C. A mixture of lead and silica
D. Graphite

48. The silicate chains are present in
A. silica B. asbestos
C. beryl D. clays

49. The three-dimensional silicate anion $(Si_2O_5{}^{2-})n$ is present in
A. Beryl B. Asbestos
C. Silica D. Clays

50. The green colour of glass is due to the presence of
    A. chromium (III)
    B. cobalt (II)
    C. Mn (IV)
    D. iron (III)

51. Red color of glass is due to the presence of
    A. Cu_2O
    B. MnO_2
    C. CoO
    D. CdS

52. Blue colour of glass is due to the presence of
    A. cobalt (II)
    B. chromium (III)
    C. iron (III)
    D. copper (II)

53. Dry ice is
    A. Solid CO
    B. Solid CO_2
    C. Solid NH_3
    D. Solid SO_2

54. Which of the following compounds combines with haemoglobin?
    A. CO_2
    B. CO
    C. NO
    D. N_2

ANSWERS

1. C	2. B	3. A	4. A
5. D	6. A	7. D	8. A
9. A	10. D	11. A	12. B
13. D	14. D	15. C	16. C
17. C	18. B	19. B	20. D
21. D	22. B	23. A	24. C
25. C	26. B	27. B	28. A
29. B	30. D	31. A	32. D
33. B	34. A	35. B	36. B
37. B	38. C	39. B	40. A
41. D	42. B	43. D	44. D
45. C	46. D	47. D	48. B
49. C	50. A	51. A	52. A
53. B	54. B		

3.7. CHEMISTRY OF NITROGEN AND PHOSPHORUS

1. Group VA of the periodic table consist of elements
   A. 3 B. 4
   C. 5 D. 6

2. Which elements are non metals?
   A. N & P B. As & Sb
   C. Sb & Bi D. Ba & Bi

3. The electronegativity of phosphorous is
   A. 3.0 B. 2.1
   C. 2.0 D. 1.9

4. The common oxidation state of elements of group V A is
   A. −3 B. +3
   C. +5 D. Any of above

5. Which of the following molecule is diatomic?
   A. Nitrogen B. Phosphorous
   C. Arsenic D. Antimony

6. Artificial nitrogen fixation may occur by the formation of
   A. Nitric acid B. Ammonia
   C. Nitrides D. Any of above

7. Among oxides of nitrogen, all are gases except
   A. N_2O_5 B. N_2O
   C. NO D. N_2O_3

8. A colorless gas with pleasant odour and sweet taste
   A. N_2O B. N_2O_3
   C. NO D. N_2O_4

9. Which of the following with an equal volume mixture explodes with violence?
   A. H_2 & N_2O B. H_2 & NO
   C. H_2 & N_2O_4 D. H_2& N_2O_3

10. Which of the following color gas, on condensing it gives a dark blue liquid?
    A. NO B. N_2O
    C. N_2O_3 D. N_2O_4

11. Which of the following acid gives both acidic and normal salts?
    A. di acid B. di basic
    C. double salt D. Any of above

12. An explosive
    A. Nitroglycerine B. Trinitrotoluene
    C. Fluorine perchlorate
    D. All above

13. Nitric acid is used in the manufacturing of
    A. Dyes B. Drugs
    C. Artificial silk D. All above

14. Nitric acid can be prepared by
    A. Ostwald,s process
    B. Birkland tyde process
    C. Both A&B D. Non above

15. In Ostwald's process of manufacturing nitric acid a mixture of ammonia gas with air is maintained with ratio
    A. 1 : 4 B. 1 : 6
    C. 1 : 8 D. 1 : 10

16. Aqua regia is made by dissolving a mixture of HNO_3 and HCl with ratio
    A. 1 : 1 B. 1 : 3
    C. 1 : 2 D. 1 : 4

17. Nitric acid has the property
    A. Nitrating B. Reducing
    C. Redoxing D. None of above

18. Nitric acid is used in manufacturing of
    A. Explosive B. H_2SO_4
    C. Fertilizer D. All above

19. Acid rain effects
 A. Human being B. Crops
 C. Aquatic life D. All above

20. Formula of orthophosphoric acid
 A. H_3PO_4 B. H_3PO_3
 C. H_3PO_2 D. $H_4P_2O_5$

21. What is the % purity of commercial phosphoric acid?
 A. 37.0% B. 82.98%
 C. 98.2% D. 90.12%

22. Urea is fertilizer
 A. Nitrogen fertilizer
 B. Potash fertilizer
 C. Phosphorous fertilizer
 D. Complete fertilizer

23. In urea the amount of nitrogen is
 A. 82.0% B. 46.0%
 C. 33.0% D. 21.0%

24. Ammonia is utilized for
 A. Manufacture of urea
 B. Oxidation to nitric acid
 C. Manufacture of ammonium sulphate
 D. All above

25. After assimilation urea leaves behind in the soil
 A. NH_3 B. CO_2
 C. Both A&B D. None of above

26. Nitrogen (N_2) is relatively unreactive, because
 A. Its electronegativity is high
 B. Its dissociation energy is large
 C. Its atomic radius is small
 D. It is the first element of group 15

27. Phosphorus normally exhibit a covalency of
 A. +1 and +2 B. +2 and +3
 C. +3 and +4 D. +3 and +5

28. Which of the following elements occurs in free state in nature?
 A. P B. N
 C. Sn D. Sb

29. Which of the following pentahalides is not formed?
 A. NF_5 B. PF_5
 C. AsF_5 D. BiF_5

30. The correct order of thermal stabilities of hydrides of group 15 is
 A $NH_3 > PH_3 > AsH_3 > BiH_3 > SbH_3$
 B $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
 C. $NH_3 < PH_3 < SbH_3 > AsH_3 > BiH_3$
 D. $BiH_3 > SbH_3 > AsH_3 > PH_3 > NH_3$

31. Arrange the hydrides of group 15 in the correct order of reducing nature.
 A. $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$
 B. $NH_3 > Ph_3 > AsH_3 > SbH_3 > BiH_3$
 C. $PH_3 < AsH_3 < SbH_3 < BiH_3 < NH_3$
 D. $PH_3 > AsH_3 > SbH_3 > BiH_3 > NH_3$

32. Arrange the hydrides of group 15 in the order of increasing boiling points.
 A. $PH_3 < AsH_3 < SbH_3 < BiH_3 < NH_3$
 B. $PH_3 < AsH_3 < SbH_3 < NH_3 < BiH_3$
 C. $PH_3 < AsH_3 < NH_3 < SbH_3 < BiH_3$
 D. $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$

33. The basic strength of hydrides of group 15 elements vary in the following order
 A. $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
 B. $PH_3 > NH_3 > AsH_3 > SbH_3 > BiH_3$
 C. $BiH_3 > NH_3 > PH_3 > AsH_3 > SbH_3$
 D. $NH_3 > PH_3 > SbH_3 > AsH_3 > BiH_3$

34. Which of following trihalides of nitrogen behaves as the weakest base?
 A. NF_3 B. NCl_3
 C. NBr_3 D. NI_3

35. Which trihalide is not hydrolysed by water
 A. NF_3 B. NCl_3
 C. PCl_3 D. $AsCl_3$

36. Which catalyst is used in Contact process?
 A. SO_3 B. FeO
 C. V_2O_5 D. (N_2O_3

37. Pick out the incorrect statement.
A. In PCl_5, P atom is sp^3d-hybridized and has trigonal bipyramidal geometry.
B. PCl_5 on hydrolysis forms phosphoric acid
C. PCl_5 acts as Lewis acid
D. In PCl_5, the axial chlorine atoms are closer to central 'P' atom than equatorial chlorine atoms

38. Arrange the oxides of group 15 elements in decreasing order of their acidity.
A. $N_2O_5 > P_2O_5 > As_2O_5 > Sb_2O_5 > Bi_2O_5$
B. $Bi_2O_5 > Sb_2O_5 > As_2O_5 > P_2O_5 > N_2O_5$
C. $P_2O_5 > N_2O_5 > As_2O_5 > Sb_2O_5 > Bi_2O_5$
D. $N_2O_5 > Bi_2O_5 > P_2O_5 > As_2O_5 > Sb_2O_5$

39. In which of the following compounds the oxidation state of N is +1?
A. N_2O B. NO_2
C. N_2O_4 D. NO

40. Formula of Gibbsite is
A. $Al_2O_3.3H_2O$ B. $Al_2O_3.2H_2O$
C. $Al_2O_3.H_2O$ D. Al_2O_3

41. Which of the following elements of group 15 is a typical metal?
A. P B. As
C. Sb D. Bi

42. Which of the following elements display maximum tendency to form p π- p π multiple bonds with itself and with carbon and oxygen?
A. N B. P
C. As D. Bi

43. Which of the following does not form stable diatomic molecule?
A. Nitrogen B. Phosphorus
C. Hydrogen D. Oxygen

44. The oxidation states shown by phosphorus is/are
A. −3 B. +3
C. +3 and +5 D. −3, +3 and +5

45. White phosphorus is usually kept under
A. Cold water
B. Ammonia liquor
C. Ethanol D. Kerosene

46. Which of the following statement is correct?
A. PH_3 is more basic than ammonia
B. PH_3 is less basic than ammonia
C. PH_3 is equally basic as ammonia
D. NH_3 is amphoteric and PH_3 is basic

47. Ostwald's process for the manufacture of HNO_3 involves the
A. oxidation of N_2 to NO
B. oxidation of NH_3 to NO in presence Pt/Rh catalyst
C. combination of N_2 and O_2
D. combination of H_2O and N_2O_5

48. The strongest acid is
A. HNO_2 B. HNO_3
C. $H_2N_2O_2$ D. None of above

49. Phosphorus has the oxidation state of +3 in
A. Orthophosphoric acid
B. Hypophosphoric acid
C. Metaphosphoric acid
D. Orthophosphorus acid

50. The Ostwald process is the main method for the manufacture of nitric acid. In the first step in this process is
A. Nitrogen and hydrogen react to form NH_3
B. Ammonia is burned in O_2 to generate N_2 and H_2O
C. Nitrogen and oxygen react to form NO_2
D. Ammonia is burned with O_2 to generate NO and H_2O

ANSWERS

1. C	2. A	3. B	4. D	25. B	26. B	27. D	28. B
5. A	6. D	7. A	8. A	29. A	30. B	31. A	32. C
9. A	10. C	11. B	12. D	33. A	34. A	35. A	36. C
13. D	14. B	15. C	16. B	37. D	38. A	39. A	40. A
17. A	18. D	19. D	20. A	41. D	42. A	43. B	44. D
21. B	22. A	23. B	24. D	45. A	46. B	47. B	48. B
				49. D	50. D		

3.8. CHEMISTRY OF OXYGEN AND SULPHUR

1. Group IV A consist of elements
A. 3
B. 4
C. 5
D. 6

2. Electronegativity of oxygen is
A. 2.5
B. 3.5
C. 2.4
D. 2.1

3. Oxygen and sulphur exist in state
A. Free
B. Combined
C. Both free & combined
D. None of above

4. Molecule of oxygen is
A. Diamagnetic
B. Paramagnetic
C. Both A&B
C. None of above

5. The formula of sulphur sesquioxide
A. SO_4
B. S_2O_7
C. S_2O_3
D. SO_3

6. SO_2 acts as
A. Lewis base
B. Lewis acid
C. Both A & B
D. None of above

7. The structure of SO_2 is
A. Linear
B. Angular
C. V-shaped
D. Planner

8. SO_3 exists in form
A. α-SO_3
B. β-SO_3
C. γ-SO_3
D. All above

9. Which of the following is a peroxy acid?
A. H_2SO_5
B. $H_2S_2O_6$
C. H_2SO_4
D. $H_2S_2O_7$

10. Which of the following is a thionic acid?
A. $H_2S_2O_3$
B. $H_2S_2O_6$
C. $H_2S_2O_8$
D. $H_2S_2O_7$

11. H_2SO_3 acts as gent
A. Reducing
B. Oxidizing
C. Both A&B
D. None of above

12. H_2SO_4 is manufactured by
A. The lead chamber process
B. The contact process
C. Both A & B
D. The Ostwald's process

13. The commonly used catalyst in the manufacture of H_2SO_4
A. Fe_2O_3 with a little CuO
B. V_2O_5
C. Platinized asbestos and $MgSO_4$
D. All above

14. Gases and dust particles are removed from H_2SO_4 by
A. Tyndal effect
B. Drying tower
C. Absorption tower
D. Contact converter

15. The H_2SO_4 obtained by the contact process having purity
A. 70%
B. 74%
C. 78%
D. 82%

16. The contact process is mainly used when acid is required for the manufacture of
A. Explosives
B. Fine chemicals
C. Lead accumulators
D. All above

17. The specific gravity of H_2SO_4 is
A. 1.37
B. 1.84
C. 1.17
D. 1.57

18. H_2SO_4 is used
   A. In the preparation of aqua regia
   B. In the purification of gold and silver
   C. In the dental filling
   D. None of above

19. Perdisulphuric acid is
   A. Marshal acid B. Caro acid
   C. H-acid D. None of above

20. Black and white photographic film contain small grains of
   A. Silver bromide B. Silver chloride
   C. Silver iodide D. Any of above

21. Which electronic configuration belongs to an element of group 16?
   A. $[He]2s^2\ 2p^2$ B. $[Ne]\ 3s^2\ 3p^4$
   C. $[Ar]\ 3d^5\ 4s^1$
   D. $[Ar]\ 3d^{10}\ 4s^2\ 4p^6$

22. O_2 molecule is
   A. Ferrmagnetic B. Ferromagnetic
   C. Paramagnetic D. Diamagnetic

23. Thermal stability of hydrides of group 16 elements decreases in the following order
   A. $H_2Po > H_2Te > H_2Se > H_2S\ .\ H_2O$
   B. $H_2O > H_2S > H_2Se > H_2Te > H_2Po$
   C. $H_2S > H_2Se > H_2O > H_2Te > H_2Po$
   D. $H_2S > H_2Se > H_2Te > H_2O > H_2Po$

24. Boiling points of hydrides of group 16 increase in the order
   A. $H_2O > H_2S > H_2Se > H_2Te$
   B. $H_2S > H_2Se > H_2Te > H_2O$
   C. $H_2O > H_2Te > H_2Se > H_2S$
   D. $H_2S > H_2Te > H_2Se > H_2O$

25. Hydrides of group 16 are weakly acidic in nature. The correct order of acidity is
   A. $H_2O > H_2S > H_2Se > H_2Te$
   B. $H_2Te > H_2O > H_2S > H_2Se$
   C. $H_2Te > H_2Se > H_2S > H_2O$
   D. $H_2Te > H_2Se > H_2O > H_2S$

26. Which of the following reactions is employed to produce ozone in the laboratory ?
   A. Exposure of air to UV light
   B. Reaction of F_2 with H_2O at low temperature
   C. Reaction of SO_2 with H_2O_2
   D. Passage of silent electric discharge through oxygen

27. Which of the following is not true for ozone?
   A. It is a strong sterilizing agent
   B. It attacks organic compounds containing carbon-carbon double bond
   C. Its molecular is linear and has two different O-O bond lengths
   D. It is more powerful oxidising agent at molecular oxygen

28. Pick out the incorrect statement regarding ozone
   A. O_3 is an unstable, dark-blue diamagnetic gas
   B. The central oxygen in O_3 is sp^2. hybridized
   C. It causes the tailing of mercury
   D. It does not react with KOH

29. Which of the following is incorrect?
   A. Water is more polar than H_2S
   B. H_2O_2 is a planar molecule
   C. Heavy water is produced by the exhaustive electrolysis of water made acidic
   D. H_2O_2 acts both as oxidising as well as reducing agent in acidic medium

30. Which among the following is a false statement?
   A. SO_3 is obtained by the catalytic oxidation of SO_2
   B. SO_3 has trigonal planar geometry is gaseous state
   C. SO_3 in gaseous state has all S-O bonds equivalent
   D. SO_3 gas shows more solubility in water than in H_2SO_4

31. Oxalic acid when heated with conc. H_2SO_4, it gives out
A. H_2O and CO_2
B. CO and CO_2
C. CO_2 and H_2S
D. Oxalic sulphate

32. Pick out the incorrect statement for SO_2.
A. It turns filter paper moistened with acidified $K_2Cr_2O_7$
B. It turns starch iodate paper blue
C. It does not react with chlorine in presence of charcoal
D. It decolourises acidified $KMnO_4$ solution

33. When a lead is storage battery is discharged
A. SO_2 is evolved
B. PbS is consumed
C. Pb is formed
D. H_2SO_4 is consumed

34. B.P of heavy water is
A. Equal to that of ordinary water
B. Greater than that of ordinary water
C. Less than that of ordinary water
D. Equal to that of distilled water

35. Ozone is not
A. An allotrope
B. A powerful oxidizing agent
C. Paramagnetic
D. A bent molecule

36. Which of the following statements regarding the manufacture of H_2SO_4 by contact process is not true?
A. S is burnt in air to form SO_2
B. SO_2 is oxidized to SO_3 in presence of V_2O_5 as catalyst (or finely divided spongy platinum as catalyst) at a pressure of 2 atom and a temperature of about 700 K
C. SO_3 is dissolved in H_2O to get 100% H_2SO_4 acid
D. H_2SO_4 obtained by contact process is of higher purity than that obtained by lead chamber process

37. The hybridization of S in SO_2 is
A. sp
B. sp^3
C. sp^2
D. dsp^2

38. Which one of the following has the highest boiling point?
A. H_2O
B. H_2S
C. H_2Se
D. H_2Te

39. Which of the following compounds is most acidic?
A. H_2O
B. H_2S
C. H_2Se
D. H_2Te

40. Which of the following represents the fuming sulphuric acid (oleum or pyrosulphuric acid)?
A. $H_2S_2O_4$
B. $H_2S_2O_3$
C. $H_2S_2O_8$
D. $H_2S_2O_7$

41. Hypo is used in photography to
A. Reduce AgBr to metallic silver
B. Remove silver as silver salt
C. Remove undecomposed silver bromide as soluble complex
D. Remove reduced silver

42. Pick out the ideal conditions needed for the manufacture of H_2SO_4 by contact process.
A. Low temperature, high pressure and high concentration of reactants
B. Low temperature, low concentration of reactants and low pressure
C. High temperature, high pressure and high concentration of reactants
D. Low temperature, low pressure and high concentration of reactants

43. Ozone is an important constituent of stratosphere, because it
    A. Prevents the formation of smog over large cities
    B. Remove poisonous gases of the atmosphere by reacting with them
    C. Absorbs ultraviolet radiation, which is harmful to human life
    D. Destroys bacteria, which are harmful to human life.

44. Arrange the basic tendencies of the following metallic oxide in the decreasing order.
    A. $K_2O > BaO > CaO > MgO$
    B. $K_2O > MgO > BaO > CaO$
    C. $K_2O > CaO > BaO > MgO$
    D. $K_2O > MgO > CaO > BaO$

45. Arrange the acidic tendencies of the following non-metallic oxides in decreasing order.
    A. $SO_3 > N_2O_5 > SiO_2 > CO_2 > H_2O$
    B. $SO_3 > N_2O_5 > CO_2 > SiO_2 > H_2O$
    C. $SO_3 > SiO_2 > N_2O_5 > CO_2 > H_2O$
    D. $SO_3 > CO_2 > N_2O_5 > SiO_2 > H_2O$

ANSWERS

1. C	2. B	3. C	4. B
5. C	6. A	7. C	8. D
9. A	10. B	11. A	12. C
13. D	14. A	15. C	16. D
17. B	18. D	19. A	20. A
21. B	22. C	23. B	24. B
25. C	26. D	27. C	28. D
29. B	30. D	31. B	32. C
33. D	34. B	35. C	36. C
37. C	38. A	39. D	40. D
41. C	42. A	43. C	44. A
45. B			

3.9. CHEMISTRY OF HALOGENS

1. Group VII A of periodic table consist of elements
   A. 4 B. 5
   C. 6 D. 7

2. All halogens exist as covalent molecules
   A. Monoatomic B. Daitomic
   C. Triatomic D. Tetra-atomic

3. Which of the following has the highest value of electronegativity?
   A. F B. Cl
   C. Br D. I

4. The high oxidizing power of halogens is favoured by
   A. Low heat of dissociation of X_2
   B. A high electron affinity of the atom
   C. A higher hydration energy of the ion
   D. All of above

5. In their ionic compounds halogens exhibit the oxidation states of
   A. –1 B. –2
   C. –3 D. –4

6. All the halogens form oxyacide, except
   A. Flourine B. Chlorine
   C. Bromine D. Iodine

7. Flourine differs from the other members of its own group due to
   A. Its small size and low bond energy
   B. Its higher electronegativity
   C. Non-availability of d-orbitals in its valence shell
   D. All the above

8. Among all halogens no oxyacid of the following is known
   A. Flourine B. Chlorine
   C. Bromine D. Iodine

9. In Dennis's method the end of the copper caps into which graphite electrode are fixed with cement
   A. Portlant B. Bakelite
   C. Asbestos D. All of above

10. Fluorine form fluorides reacting with
    A. Metals B. Non-metal
    C. Metalloids D. Any of above

11. Fluorine is
    A. Powerful oxidizing agent
    B. Most reactive element
    C. Used as refrigerants
    D. All of above

12. Fluorine finds considerable use of DDFT which is used as
    A. herbicide B. fungacide
    C. insecticide D. nomatocides

13. Separation of isotopes of uranium is carried out by
    A. CaF_2 B. Frcon
    C. SF_6 D. HF

14. The electrolytic method superpasses all other methods due to
    A. Purity B. Cheapness
    C. Easy available D. All above

15. On industrial scale chlorine is prepared by
    A. Dennis method
    B. Deacon's process
    C. Plantner's process
    D. Aludels process

16. Greenish yellow gas with pungent irritating odour
    A. Fluorine B. Chlorine
    C. Bromine D. Iodine

17. Which of the following halogend is used for sterilization of drinking water?
A. Fluorine B. Chlorine
C. Bromine D. Iodine

18. Chlorine is used in
A. Sterilization of water
B. Extraction of gold
C. Bleaching of cotton
D. All above

19. The bromine produced on commercial scale may contain impurities of
A. Water B. Chloride
C. Iodine D. All above

20. The vapours attacks the eyes and mucous membrane of nose and throat
A. Flourine B. Bromine
C. Chlorine D. Iodine

21. Bromine is soluble in
A. Water B. Chloroform
C. Alcohol D. All above

22. Bromine is used as
A. Fungicides B. Herbicides
C. Germicides D. Insecticides

23. Bromine is used as
A. Oxidizing agent
B. Manufacture of dyes & tear gas
C. Germicides
D. All above

24. Iodine is a grey black solid and its vapours are in color
A. Grey B. Black
C. Violet D. Yellow

25. Iodine is used is
A. Tincture of iodine
B. Iodex as antiseptic
C. Treatment of goiter
D. All above

26. Iodine is used
A. Photography
B. Manufacture of dyes
C. Analgesic D. All above

27. The oxidation state of Cl in $HClO_4$
A. +7 B. +5
C. +3 D. +1

28. Increasing oxygen contents in oxyacids leads to
A. An increase in thermal stability
B. An increase in acid strength
C. A decrease in oxidizing power
D. All above

29. Which halogens is radioactive in nature
A. Astatine B. Iodine
C. Chlorine D. Fluorine

30. $HClO_2$ gives the structure of a
A. Linear B. Angular
C. Trigonal pyramidal
D. Tetra hedral

31. Which of the following is highly dangerous acid and produces severe wounds on the skin?
A. $HClO$ B. $HClO_2$
C. $HClO_3$ D. $HClO_4$

32. How many types of Interhalogens are?
A. 3 B. 4
C. 5 D. 6

33. ClF is
A. Chlorine monoflouride
B. Flourine
C. Monochlorine fluoride
D. Monoflourine chloride

34. Example of pseudohalogen group
A. Cyanogen B. Thiocyanogen
C. Selenocyanogen
D. All above

35. pKa value of hyponitrous acid ($H_2N_2O_2$) is
A. -7.0 B. 8.9
C. 4.4 D. 6.6

36. The outermost electronic configuration of most electronegative element is
A. $ns^2 np^3$ B. $ns^2 np^4$
C. $ns^2 np^5$ D. $ns^2 np^6$

37. Which of the halogens has lowest bond energy?
A. F_2
B. Cl_2
C. Br_2
D. I_2

38. Which number of halogen family does not show positive oxidation state?
A. Fluorine
B. Chlorine
C. Bromine
D. Iodine

39. Which of the following is the strongest oxidant?
A. F_2
B. Cl_2
C. Br_2
D. I_2

40. Which of the following is a false statement?
A. Halogens are strong oxidizing agent
B. Halogens show only (–I) oxidation state
C. HF molecules form intermolecular H-bonds
D. Fluorine is highly reactive

41. Chlorine gas acts as a bleaching agent only in presence of
A. Dry air
B. Moisture
C. Sunlight
D. Pure oxygen

42. Tincture of iodine is
A. KI in water
B. Iodine in KI
C. Iodine in water
D. Iodine in alcohol

43. The fluoride tooth-paste contains
A. SnF_2 and $Sn_2P_2O_7$
B. NaF
C. CaF_2
D. $H_2[SiF_6]$

44. Which compound is used in photography?
A. AgCl
B. AgI
C. AgBr
D. AgF

45. Which one of the following has the highest electron affinity?
A. F_2
B. Cl_2
C. Br_2
D. I_2

46. Deficiency of iodine in diet causes.
A. Cancer
B. Goiter
C. Leukemia
D. Anaemia

47. Which of the following hydrogen halides is the weakest in the aqueous solution?
A. HF
B. HI
C. HBr
D. HCl

48. Which of the following halogens is solid at room temperature?
A. F_2
B. Br_2
C. Cl_2
D. I_2

49. The halide which is inert to water is
A. PCl_5
B. $SiCl_4$
C. BCl_3
D. SF_6

50. Which is the strongest reducing agent?
A. HF
B. HCl
C. HBr
D. HI

51. Which of the following compounds has highest boiling point?
A. HI
B. HBr
C. HCl
D. HF

52. Which of the following has the maximum ionic character?
A. HF
B. HCl
C. HBr
D. HI

53. Which of the following halogens is most easily reduced?
A. I_2
B. Br_2
C. Cl_2
D. F_2

54. Which of the following oxo acids of chlorine is the best oxidizing agent?
A. HClO
B. $HClO_2$
C. $HClO_3$
D. $HClO_4$

55. Which of the following represents the correct order of increasing pK_a values of the given acids?
A. $HClO_4 < HNO_3 < H_2CO_3 < B(OH)_3$
B. $HNO_3 < HClO_4 < B(OH)_3 < H_2CO_3$
C. $B(OH)_3 < H_2CO_3 < HClO_4 < HNO_3$
D. $HClO_4 < HNO_3 < B(OH)_3 < H_2CO_3$

56. Pick out the incorrect statement for ClF_3.
 A. It has trigonal planar geometry
 B. It is used to make gaseous UF_6, which is useful in making enriched U-235 fuel
 C. It is used as powerful fluorinating agent for inorganic compounds
 D. ClF_3 has been used as fuel in short range rockets reacting with hydrazine.

57. Which of the following is a pseudohalide?
 A. I_3^- B. IF_7.
 C. CN^- D. ICl

58. $HClO_4$, HNO_3 and HCl are all strong acids in aqueous solution. In glacial acetic acid medium, their acid strength is such that
 A. $HClO_4 > HCl > HNO_3$
 B. $HNO_3 > HClO_4 > HCl$
 C. $HCl > HClO_4 > HNO_3$
 D. $HCl > HClO_4 > HNO_3$

59. Which of the following has maximum vapor pressur?
 A. HF B. HCl
 C. HBr D. HI

60. Which of the following is the active ingredient in ordinary household bleach?
 A. HCl B. Cl_2
 C. NaCl D. NaClO

61. What element is the most abundant by mass in the Earth's crust?
 A. Fe B. H
 C. K D. O

62. Which can be purified by sublimation?
 A. F_2 B. Cl_2
 C. Be_2 D. I_2

63. Halogens are coloured, because
 A. They are strong oxidant
 B. Their molecules are held together by weak van der Waals forces
 C. Their atoms absorb radiations from visible range causing the excitation of valence electrons to higher energy of levels
 D. Their molecules absorb light radiation forming the excited states.

64. Fluorine does not show variable oxidation state, because of
 A. Its high electronegativity
 B. Its small size
 C. Low dissociation energy of F-F bond
 D. Non-availability of d-orbitals

65. The correct increasing order of bond dissociation energy for N_2, O_2, F_2 and Cl_2 is
 A. $N_2 < O_2 < F_2 < Cl_2$
 B. $F_2 < Cl_2 < O_2 < N_2$
 C. $F_2 < Cl_2 < N_2 < O_2$
 D. $N_2 < Cl_2 < F_2 < O_2$

ANSWERS

1. B	2. B	3. A	4. D
5. A	6. A	7. D	8. A
9. B	10. D	11. D	12. B
13. C	14. D	15. B	16. B
17. B	18. D	19. D	20. B
21. D	22. C	23. D	24. C
25. D	26. D	27. A	28. D
29. A	30. B	31. D	32. B
33. A	34. D	35. B	36. C
37. A	38. A	39. A	40. B
41. B	42. D	43. B	44. C
45. B	46. B	47. A	48. D
49. D	50. D	51. D	52. A
53. D	54. A	55. D	56. A
57. C	58. A	59. D	60. D
61. D	62. D	63. D	64. D
65. B			

3.10. CHEMISTRY OF INERT GASES

1. Zero group of the periodic table consists of
   A. Four elements B. Five elements
   C. Six elements D. Eight elements

2. Zero group elements are called as
   A. Inert gases B. Rare gases
   C. Noble gases D. All of above

3. Which of the following is used in radiotherapy?
   A. Rn B. Xe
   C. Kr D. He

4. The noble gases are found in the atmosphere to the extent of about some percent by volume
   A. 0.5% B. 1.0%
   C. 1.5% D. 2.0%

5. Helium contents in the atmosphere by volume
   A. 0.0005% B. 0.0015%
   C. 0.0001% D. 0.00001%

6. Which noble gas does not obey octet rule?
   A. Rn B. Xe
   C. Kr D. He

7. The inert gases Ar, Kr and Xe form compounds with water at low temperature and high pressure. These compounds are called
   A. Halides B. Hydrates
   C. Clathrates D. All of above

8. The inert gases Ar, Kr and Xe form solid compounds with certain organic molecules under pressure known as
   A. Helides B. Hydrates
   C. Clathrates D. All of above

9. Xenon diflouride is obtained by irradiating a mixture of xenon and fluorine with light from a high pressure
   A. Mercury arc B. Tungeston arc
   C. Xenon arc D. None of above

10. XeF_4 is obtained, when a mixture of Xenon and fluorine in the ratio is heated in a nickle vessel at 400°C
    A. 1 : 3 B. 5 : 1
    C. 1 : 20 D. 1 : 5

11. Which is one of the best fluorinating agent?
    A. XeF_2 B. XeF_4
    C. XeF_6 D. None of above

12. In XeF_2 molecules, Xe atom undergoes hybridization
    A. spd B. sp^2
    C. sp^3 D. sp^3d

13. The noble gases are used due to having property
    A. Chemical inertness
    B. Low boiling point
    C. Both a and b D. None of above

14. Which of the following noble gas is used in filling luminous tubes?
    A. Xenon B. Krypton
    C. Radon D. Helium

15. Which of the following noble gas is used in cinematography?
    A. Xenon B. Krypton
    C. Radon D. Helium

16. Argon is used in filling of
    A. Discharge tubes
    B. Luminous tube
    C. Fluorescent tubes
    D. None of above

17 Which of the following noble gas is used in Geiger counter to detect radioactivity?
A. He
B. Ne.
C. Ar
D. Kr

18. Which of the following noble gas is used TV sets and sound movies to give ready response to electrical potential?
A. He
B. Ne
C. Ar
D. Kr

19. Helium is used for
A. The preservation of food
B. Filling electrical transformer
C. Pressuring agent in rockets
D. All of above

20. For the respiration of sea divers mixture is used
A. He & O_2
B. Ar & O_2
C. Ne & O_2
D. Kr & O_2

21. Which one of the following noble gases is most abundant in atmosphere?
A. He
B. Ne
C. Ar
D. Xe

22. Which one of the following noble gas is obtained by radioactive disintegrastion?
A. Kr
B. Br
C. Rn
D. Xe

23. Which of the following statements is not correct about noble gases?
A. Their ionization energies are very high
B. Their electron affinities are nearly zero
C. They do not form any chemical compounds
D. They are not easily liquefied

24. Compounds formed when noble gases get entrapped in the cavities of crystal lattices of certain organic and inorganic compounds are called
A. interstitial compounds
B. Hydrates
C. Clathrates
D. Picrates

25. The 'shape' of molecule, XeF_6 is
A. Pentagonal bipyramidal
B. Regular octahedral
C. Distorted octahedral
D. Square planar

26 Which type of hybridization of Xe is involved in $XeOF_4$ molecule?
A. sp^3
B. sp^3d
C. sp^3d^2
D. sp^3d^3

27. Pick out the incorrect statement for XeF_4.
A. XeF_4 disproportionates violently with water
B. It is used as fluorinating agent
C. It has octahedral structure (or geometry)
D. It oxidizes I^- to I_2.

28. Noble gases are used in discharge tubes to give different colours. Reddish-orange glow is due to
A. Ar
B. Ne
C. Xe
D. Kr

29. The noble gas used for treatment of cancer is
A. Helium
B. Argon
C. Radon
D. Krypton

30. Helium-oxygen mixture is used by deep sea divers in preference to nitrogen-oxygen mixture, because
A. Helium is much less soluble in blood than nitrogen
B. Nitrogen is much less soluble in blood than helium
C. Due to high pressure deep under the sea, nitrogen and oxygen react to give poisonous nitric oxide
D. Nitrogen is highly soluble in water

31. Helium is used in weather balloons and airships instead of H2, because it is
A. Lighter than hydrogen
B. Incombustible

C. More abundant than hydrogen
D. Radioactive

32. The noble gas which was discovered first in the sun and then on the earth is
A. He B. Ne
C. Ar D. Xe

33. Xe reacts directly with
A. O_2 B. Cl_2
C. F_2 D. Br_2

34. The geometry of XeF_2 is
A. Triangular planar
B. Square planar
C. Linear
D. Trigonal bipyramidal

35. The states of hybridization of Xe in XeF_4 and XeF_6 are
A. sp^3d^2, sp^3d^3 B. sp^3d^3, sp^3d^2
C. sp^3d^3, sp^3d^2 D. none of these

36. Which one of the following is not correct?
A. Ar is used in electric bulbs
B. Kr is obtained during radioactive decay
C. Boiling point of He is lowest among all noble gases
D. Xe forms $XeOF_4$

37. Xenon reacts best with
A. The most electropositive elements
B. The most electronegative elements
C. The hydrogen halides
D. Non-metals

38. Which of the following is not known?
A. KrF_6 B. XeF_6
C. XeO_3 D. KrF_2

39. Helides are compounds of which noble gas
A. He B. Xe
C. Kr D. Ne

40. Which of the following noble gas is more reactive?
A. Kr B. Xe
C. Rn D. Kr

ANSWERS

1. C	2. D	3. A	4. B
5. A	6. D	7. B	8. C
9. A	10. B	11. C	12. D
13. C	14. B	15. B	16. C
17. C	18. B	19. D	20. A
21. C	22. C	23. C	24. C
25. C	26. C	27. C	28. B
29. C	30. A	31. B	32. A
33. C	34. C	35. A	36. B
37. B	38. A	39. A	40. C

3.11. CHEMISTRY OF *d*-BLOCK ELEMENTS

1. Elements in which differentiating electron enters the $(n-1)^{th}$ d-orbitals of the $(n-1)^{th}$ main shell are called elements
   A. s-block B. p-block
   C. d-block D. f-block

2. Which of the following is non-typical transition metal?
   A. Zn B. Mn
   C. Cr D. Co

3. Unlike s-block elements d-block elements forms which compounds as well
   A. Ionic compound
   B. Covalent compound
   C. Coordinate compounds
   D. None of above

4. The atomic and ionic radii value ——— on moving from left to right in the series
   A. Increase B. Decrease
   C. Does not change
   D. None of above

5. The trace metal present in insulin is
   A. Mn B. Co
   C. Zn D. Fe

6. In which compound the oxidation state of Mn is highest?
   A. $KMnO_4$ B. MnO_2
   C. MnO D. None of above

7. Number of unpaired electrons in Cu^{2+} ions is
   A. 1 B. 2
   C. 3 D. 4

8. The colour of Ni^{2+} ion is
   A. Blue B. Green
   C. Deep green D. Orange

9. The central metal atom or ion and the ligands that are directly attached to it are enclosed in a square bracket called
   A. Coordination complex
   B. Coordination number
   C. Coordination sphere
   D. Coordination compounds

10. The bonding in transition metal complex was not well understood until the poineer work of
    A. PS Jaiswal B. GS Manku
    C. BR Thukral D. Alfred Werner

11. The correct formula form of the coordination compounds is
    A. $PtCl_4.6NH_3$ B. $[Pt(NH_3)_6]Cl_4$
    C. Both A & B D. None of above

12. Which of the following is neutral ligand?
    A. NH_3 B. H_2O
    C. CO & NO D. All of above

13. The suffix "ate" at the end of the name of the complex signifies that it is
    A. Cation B. Anion
    C. Neutral D. None of above

14. $CoCl_3$ $6NH_3$ has six NH_3 molecules that satisfy which valency of the Co^{3+} metal ion
    A. Primary B. Secondary
    C. Both A & B D. None of above

15. Oxidation state of the chromium in $[Cr(NH_3)_6]^{3+}$ complex ion is
    A. +2 B. +3
    C. +4 D. +5

16. Which show maximum number of oxidation states in 3d series?
A. Mn B. Ni
C. Co D. Zn

17. What type of bonding occurs in d-block elements?
A. Ionic B. Covalent
C. Metallic D. Both B & C

18. Metals are
A. Hard B. Malleable
C. Ductile D. All

19. Transition metal possess
A. Definite color
B. Catalytic power
C. Both A & B D. None of above

20. Coordination compound show
A. Structural isomerism
B. Stereo-isomerism
C. Both A & B D. None of above

21. According to CFT, the metal ligand bond is considered to be ionic to percentage
A. 100% B. 90%
C. 80% D. 70%

22. Major achievement of CFT is
A. Interpreting the color
B. Adsorption spectra
C. Both A & B D. None of above

23. VBT is unable to explain the nature of some of the complexes of
A. Cobalt B. Copper
C. Nickle D. Manganese

24. VBT does not explain
A. Absorption spectra
B. Color of transition metal ion
C. Heat of formation
D. All above

25. The color of transition metals is due to
A. d-d transitions B. n-π transitions
C. Ionization
D. Loss of s electron

26. Which of the following cations has maximum number of unpaired electrons?
A. Fe^{2+} B. Co^{2+}
C. Mn^{2+} D. Ni^{2+}

27. On the basis of CFT the bonding between the metal and ligand is totally
A. Ionic B. Covalent
C. Coordinate D. Metallic

28. CFT can very well explain
A. Color
B. Magnetic properties
C. Spectra of transition metal
D. All

29. In group theory, the triply degenerate set is denoted by
A. eg B. t_2g
C. e_2g D. tg

30. The energy gap between t_2g and eg sets in denoted by
A. Δ° B. 10 Dq
C. Both A & B D. 1 Dq

31. Δ°or 10 Dq is called crystal field
A. Energy
B. Splitting energy
C. Stabilization energy
D. None of above

32. The common ligands can be arranged in order of their increasing splitting power to cause d-orbitals splitting. This series is called as
A. Electro-chemcial
B. Spectro-chemical
C. Physico-chemical
D. Spectro-electrical

33. Which are not considered member of d-block elements?
A. Zn B. Cd
C. Hg D. All above

34. CFSE (high spin) for d^7 ion is
A. 0.8 B. −0.8
C. −1.8 D. 1.8

35. Which of the following d-block elements can show highest oxidation number in its compounds?
A. Cr B. Co
C. Zn D. Mn

36. The solution of the transition metal complexes having one or more unpaired electrons in the d-orbital are
A. Coloured B. Colourless
C. White D. Black

37. The maximum absorption in $[Ti(OH_2)_6]^{3+}$ take place at wavelength of
A. 4000 Å B. 5000 Å
C. 6000 Å D. 10000 Å

38. $[Ti(OH_2)_6]^{3+}$ gives colour
A. Green B. Red
C. Purple D. Blue

39. If the absorbed light is green the transmitted light will be
A. Purple B. Orange
C. Violet D. Red

40. The secondary valency of Co in $CoCl_3.6NH_3$ is
A. 2 B. 4
C. 6 D. 8

41. Which of the following has maximum number of unpaired electrons?
A. Fe^{3+} B. Fe^{2+}
C. Co^{2+} D. Co^{3+}

42. The electronic configuration of chromium is $4s^1$ $3d^5$. The element tungsten (W) belongs to the same group and has atomic number = 74. The configuration of its valence shell is
A. $5s^1$ $4d^1$ B. $6s^1$ $5d^5$
C. $6s^0$ $5d^6$ D. $6s^2$ $5d^4$

43. Pick out the incorrect statement for transition metals.
A. Cu^+ is not a transition metal ion
B. Transition metals do not exhibit variable oxidation states
C. Transition metal ions are coloured
D. Transition metals and majority of their compounds are paramagnetic

44. Which of the following do not have variable valency?
A. Mn B. Cr
C. Ni D. Zn

45. Pick out the incorrect statement for transition metals
A. They have low melting and boiling points
B. 5d-elements have higher energies than 3d or 4d elements
C. Zr and Hf have almost identical atomic and ionic radii
D. They form interstitial compounds

46. Which one of the following statements is not true?
A. Transition metals form alloys
B. Transition metals form complexes
C. Zn, Cd and Hg are transition metals
D. $K_2[PtCl_6]$ is a well-known compound

47. Which of the following exist as liquid at room temperature?
A. Hg B. Co
C. Mn D. Cu

48. Which one of the following oxides is basic?
A. MnO B. Mn_2O_3
C. MnO_2 D. Mn_2O_7

49. Which of the following is not a neutral ligand?
A. CO B. H_2O
C. CN^- D. NH_3

50. The yellow colour of chromates changes to orange-red on acidification, due to the formation of

A. Cr^{3+} B. Cr_2O_3
C. $Cr_2O_7^{2-}$ D. CrO_3

51. Pick out the incorrect statement about $K_2Cr_2O_7$.

A. It is thermally stable
B. It dissolves in alkali to form chromate
C. It oxidizes acidified $FeSO_4$ solution to $Fe_2(SO_4)_3$
D. It is used as cleansing agent for glassware, etc. when mixed with cold conc. H_2SO_4.

52. Which of the following species do not act as ligand in the formation of complexes?

A. Cl^- B. OH^-
C. CH_3NH_2 D. H^+

53. In the metallurgy of iron, when limestone is added to the blast furnace, the calcium ion ends up in

A. Slag B. Gangue
C. Metallic calcium
D. Calcium carbonate

54. Finely divided iron combines with CO to give

A. $Fe(CO)_5$ B. $Fe_2(CO)_9$
C. $Fe_3(CO)_{12}$ D. $Fe(CO)_6$

55. Which of the following is not correct?

A. Rusting of iron can be stopped by increasing the concentration CO_2 in water
B. Rusting of iron is electrochemical in nature
C. Rusting of iron takes place in moist air
D. Rusting of iron produces hydrated iron (III) oxide

56. The rusting of iron is catalysed by which of the following?

A. Fe B. O_2
C. Zn D. H^+

57. Which of the following alloys contains(s) Cu and Zn?

A. Bronze B. Brass
C. Gun-metal D. Type metal

58. Which of the following is soluble in water?

A. AgF B. AgCl
C. AgBr D. AgI

59. Gold dissolves in aqua regia forming

A. AuCl B. $Au(NO_3)_3$
C. $AuCl_3$ D. $HAuCl_4$

60. Zinc oxide is

A. A basic oxide
B. An amphoteric oxide
C. An acidic oxide
D. A neutral oxide

61. Variable oxidation states is shown by

A. Normal elements
B. Metallic elements
C. Non-metallic elements
D. Transition elements

62. The maximum oxidation shown by manganese is

A. +2 B. +4
C. +5 D. +7

63. The number of unpaired electrons in Fe^{2+} (atomic number = 26) is

A. 3 B. 2
C. 4 D. 5

64. Colour in transition metal compounds is attributed to

A. Small-sized metal ions
B. Absorption of light in UV region
C. Complete ns sub-shell
D. Incomplete (n – 1) d sub-shell

65. Which one of the following ions is colourless?

A. Cu^+ B. Co^{2+}
C. Ni^{2+} D. Fe^{3+}

66. Which of the following statements is false about transition metals?
   A. They form complexes
   B. They show variable valency
   C. All transition metal compounds are paramagnetic
   D. They form coloured ions

67. Transition elements, in general, exhibit the following properties, except one. Name that property
   A. Variable oxidation state
   B. Natural radioactivity
   C. Tendency to form complexes
   D. Formation of alloys

68. Zeigler-Natta catalyst is
   A. Pt/PtO
   B. $TiCl_4/Al(C_2H_5)_3$
   C. Pt/Rh
   D. Pt

69. The most stable oxidation state of chromium is
   A. +6
   B. +4
   C. +3
   D. +2

70. The substance used cancer therapy is
   A. Fe
   B. Co
   C. Ni
   D. Rn

71. In the froth flotation process for the purification of ores, the ore particles floats because
   A. They are light
   B. Their surface is not easily wetted by water
   C. They bear electrostatic charge
   D. They are insoluble

72. Molten iron withdrawn from the blast furnace is called
   A. Wrought iron
   B. Pig iron
   C. Bessemer iron
   D. Stainless steel

73. Pig iron is also called
   A. Cast iron
   B. Steel
   C. Wrought iron
   D. Stainless steel

74. In the extraction of iron, the furnace change consists of iron ore, coke and limestone. The function of limestone is to act as
   A. An oxidising agent
   B. A reducing agent
   C. Flux
   D. Slag

75. If steel is heated to a temperature well below red heated and is then cooled slowly, the process is called
   A. Annealing
   B. Quenching
   C. Tempering
   D. Nitriding

76. Stainless steel contains
   A. Fe + Cr + Ni
   B. Fe + Ni + Cu
   C. Fe + Cr + Cu
   D. Cu + C + Ni

77. Carbon in wrought iron is present as
   A. Silicon carbide
   B. Iron carbide (Fe_3C) or cementite
   C. Graphite
   D. Partly as iron carbide and partly as graphite

ANSWERS

1. C	2. A	3. B	4. B
5. C	6. A	7. A	8. B
9. C	10. D	11. B	12. D
13. B	14. B	15. B	16. A
17. D	18. D	19. C	20. C
21. A	22. C	23. B	24. D
25. A	26. C	27. A	28. D
29. B	30. C	31. B	32. B
33. D	34. A	35. D	36. A
37. B	38. C	39. A	40. C
41. A	42. D	43. B	44. D
45. A	46. C	47. A	48. A
49. C	50. C	51. A	52. D
53. A	54. A	55. A	56. D
57. B	58. A	59. D	60. B
61. D	62. D	63. C	64. D
65. A	66. C	67. B	68. B
69. C	70. B	71. B	72. B
73. A	74. C	75. A	76. A
77. B			

3.12. CHEMISTRY OF F-BLOCK ELEMENTS

1. The elements in which the additional electron enters (n-2) f orbital are called
   A. s block elements
   B. p block elements
   C. f-block elements
   D. None of above

2. The 4f block elements are also called
   A. Lanthanides B. Lanthanones
   C. Rare-earths D. Above all

3. How many elements are members of lanthanides?
   A. 12 B. 13
   C. 14 D. 15

4. Which of the following are important minerals of lanthanides?
   A. Monazite B. Euxenite
   C. Xenotime D. Above all

5. The % of Ce-earths in Monazite is
   A. 50-60 % B. 50-70 %
   C. 40-50% D. 30-40%

6. The % of Ye-earths in Xenotime is
   A. 50-60 % B. 54-65 %
   C. 40-50% D. 30-40%

7. The location of significant deposits of lanthanides is
   A. USA B. Brazil
   C. South Africa D. All above

8. Which of the following is not a member of lanthanides?
   A. La B. Ba
   C. Nd D. Sm

9. Which of the following classical methods is used to separate lanthanides?
   A. Fractional crystallization
   B. Fractional precipitation
   C. Fractional thermal decomposition
   D. All above

10. Which of the following modern methods is used to separate lanthanides?
    A. TLC B. Ion-exchange
    C. Complex formation.
    D. All above

11. The common oxidation state of lanthanides is
    A. +1 B. +2
    C. +3 D. +5

12. The +2 and +4 oxidation sates is shown by which lanthanides
    A. Sm B. Ce
    C. Er D. Lu

13. The lanthanide contraction is due to decrease in
    A. Electron affinity
    B. Ionic size
    C. Electronegativity
    D. Metallic character

14. The color of lanthanides is due to
    A. f-f transition B. d-d transition
    C. s-p transition D. None of above

15. The alloys of lanthanides are known as
    A. Coinage metals B. Mish metals
    C. Precious metals D. None of above

16. The lanthanides are used in
    A. Paints
    B. Nuclear industry
    C. Abrasives D. All above

17. The % of Ce-earths in Monazite is
    A. 50-60 % B. 50-70 %
    C. 40-50% D. 30-40%

18. The elements in which the extra electron enters 5f-orbitals of the (n-2)th main shell are known as
A. 5f-block elements
B. Actinides
C. Actinones
D. All above

19. Which of the following does not belong to actinides?
A. Bk
B. Tb
C. Es
D. Am

20. Which of the following oragnic solvents is commonly used for seperation of actinides?
A. Hexone
B. Diethyl ether
C. TBP
D. All above

21. Which of the following elements shows maximum variable oxidation states among the actinides?
A. Np
B. Am
C. Pu
D. All above

22. Which of the following elements shows +2 oxidation state among the actinides?
A. Th
B. Ac
C. U
D. Am

23. Which of the following elements shows only +4 oxidation state among the actinides?
A. Am
B. Ac
C. U
D. Th

24. Which of the following elements shows only +3 oxidation state among the actinides?
A. Th
B. U
C. U
D. Fm

25. Which of the following elements shows color spectra among the actinides?
A. Np
B. Pu
C. U
D. All above

ANSWERS 10

1. C	2. D	3. D	4. D
5. B	6. B	7. D	8. B
9. D	10. D	11. C	12. A
13. B	14. B	15. B	16. D
17. B	18. D	19. B	20. D
21. D	22. D	23. D	24. D
25. D			

3.13. GENERAL INORGANIC CHEMISTRY

1. Highly viscous solvents hinders the ionic
(A) mobility (B) precipitation
(C) Diffusion (D) All above

2. Organic compounds having protonation sites act as
(A) Acids (B) Bases
(C) Amphoteric (D) Neutral

3. Hydrogen bonding in liquid ammonia is ——— than water
(A) Weaker (B) Stronger
(C) Equal (D) Very strong

4. Metal solutions in liquid ammonia are
(A) Paramagnetic (B) Diamagnetic
(C) Feromagnetic (D) Perimaganetic

5. Acidity of CH_3COOH ——— in liquid ammonia
(A) Decreases (B) Increases
(C) Basic (D) Not effected

6. SO_2 is a good solvent for
(A) Ionic compounds
(B) Organic compounds
(C) Inorganic compounds
(D) Covalent compounds

7. Most of the organic synthetic reactions are carried in
(A) Liquid ammonia
(B) liquid SO_2 (C) liquid HF
(D) water

8. In CO molecule oxygen atom is
(A) sp hybridized
(B) sp^2 hybridized
(C) sp^3 hybridized
(D) dsp^3 hybridized

9. Bonding in metal carbonyls obeys
(A) EAN rule
(B) 18 electron rule
(C) Octet rule (D) All above

10. Physical evidences that support the multiple nature of M-CO bonds are
(A) Bond length
(B) Vibrational spectra
(C) X ray study (D) All above

11. $Ru(CO)_5$ and $Ni(CO)_4$ are ——— at room temperature
(A) Liquids (B) Solids
(C) Gases (D) Vapours

12. $Fe(CO)_5$ forms explosive mixture with
(A) Water (B) air
(C) N_2 (D) He

13. $Mn_2(CO)_{10}$ is crystalline solid having
(A) Golden yellow color
(B) Light yellow color
(C) Brown color (D) Blue color

14. Bridging is most common for the metals of
(A) 1st transition series
(B) 2nd transition series
(C) Alkali metals (D) lanthanides

15. Carbonyl halides are usually
(A) White solids (B) Yellow solids
(C) Both a and b (D) Green solids

16. Strongly solvating but non ionised solvents are
(A) THF (B) DMSO
(C) DMF (D) all

17. Highly polar and auto ionising solvents are
(A) THF (B) IF_5
(C) BrF_3 (D) both b and c

18. HF is a liquid in temperature range
(A) – 83°C -19.5°C
(B) – 88°C- 19.5°C
(C) – 83°C -29.5°C
(D) – 83°C - 39.5°C

19. The bond order for the O_2^+ ion.
(A) 3 (B) 1½
(C) 2½ (D) 2

20. What is the hybridization of the oxygen atom in water?
(A) sp (B) sp^2
(C) sp^3 (D) dsp^2

21. Which of the following molecules has unpaired electrons in antibonding molecular orbitals?
(A) O_2 (B) N_2
(C) Br_2 (D) F_2

22. The bond angle in water is
(A) 109° (B) 104.5°
(C) 107.0° (D) 120°

23. Which of the following molecules has a coordinate bond?
(A) NH_4Cl (B) NaCl
(C) $CaCl_2$ (D) PCl_3

24. The bond length in C-C is ——— (nm)
(A) 0.154 (B) 0.134
(C) 0.112 (D) 0.116

25. What is the geometry of a molecule where the central atom has 2 lone pairs and makes two covalent bonds?
(A) Tetrahedral (B) Linear
(C) Bent
(D) Trigonal planar

26. Unpaired electron in a molecule gives ________ character.
(A) Ferromagnetic
(B) Diamagnetism
(C) Paramagnetic
(D) Both a & b

27. Which type of hybridization involve in the IF molecule
(A) sp (B) sp^2
(C) sp^3 (D) dsp^2

28. Cl-Cl bond angle in PCl_3 is (degree)
(A) 99 (B) 100
(C) 101 (D) 102

29. The shape of $SeCl_2$ molecule is
(A) Trigonal (B) Tetrahedral
(C) Bent angular (D) T-shape

30. VSEPR was proposed first time by
(A) Gillespie & Nyholm
(B) Sedgwick & Powell
(C) Pauling & Slaughter
(D) Hunds & Mullikan

31. Bond order of the NO^+ is
(A) 4 (B) 3
(C) 2 (D) 1

32. Valence shell electrons in the CN^-
(A) 10 (B) 9
(C) 8 (D) 7

33. O_2^- is ——— in nature
(A) Ferromagnetic
(B) Diamagnetism
(C) Paramagnetic
(D) Both a & b

34. Coordinate compounds are
(A) Polar (B) Non polar
(C) Semi polar (D) None of above

35. d^2sp^3 is oriented in a manner
(A) Trigonal (B) Tetrahedral
(C) Octahedral
(D) Trigonal bipyramidal

36. The bond order for BO molecule is
(A) 2.5 (B) 3.0
(C) 2.0 (D) 3.5

37. Example of linear geometry
(A) XeF_2 (B) BeF_2&$HgCl_2$
(C) CdI_2&$AgCl_2$ (D) All of above

38. In which of the following compounds does hydrogen bonding occur?
(A) CCl_4 (B) NaH
(C) HI (D) NH_3

39. Which of the following bonds will be non-polar?
(A) N-H (B) O-H
(C) C-H (D) Cl-Cl

40. Which of the following compound does not following octet rule?
(A) CS_2 (B) PBr_3
(C) IBr (D) BrF_5.

41. H-bonding also exist in living system like
(A) Protein (B) DNA
(C) Both A and B (D) None of above

42. The type of bonding in HCl is
(A) Pure covalent
(B) Polar covalent (C) highly polar
(D) Hydrogen bonding

43. Type of hybrid orbitals used by the chlorine atom in ClO_2^- is
(A) sp^3 (B) sp^2
(C) sp (D) None of these

44. Protophilic solvents are also called
(A) Acidic (B) Basic
(C) Neutral (D) Amphoteric

45. All stable metal carbonyls obey 18 e- rule except
(A) $V(CO)_6$ (B) $Co_2(CO)_8$
(C) $Cr(CO)_6$ (D) $Ni(CO)_4$

46. Which of the following have identical bond order?
(A) CN^- and O_2^- (B) CN^- and NO^+
(C) O_2^- and CN^+ (D) NO^+ and CN^+

47. H_2^+ has bond order
(A) 1.5 (B) 2
(C) 0.5 (D) 3

48. The geometry of Ni-tetracarbonyl is
(A) Hexagonal (B) Trigonal
(C) Trigonal bipyramidal
(D) Regular tetrahedral

49. Thionyl halides which are capable of providing SO^{+2} ions are regarded as
(A) Acids (B) Base
(C) Amphoteric (D) Alkali

50. What is the coordination number of Ni in nickel-DMG cpmlex?
(A) 2 (B) 3
(C) 6 (D) 4

51. The cation that does not form an ammine complex with excess of ammonia is
(A) Al^{3+} (B) Ag^+
(C) Cu^{2+} (D) Cd^{2+}

52. The EAN of Ni in $NI(CN)_4^{2-}$ is
(A) 34 (B) 35
(C) 36 (D) 38

53. Effective atomic number of Fe in $Fe(CO)_5$ is
(A) 26 (B) 36
(C) 35 (D) 54

54. Which is the correct value of x in Cr(CO)x ?
(A) 2 (B) 4
(C) 6 (D) Unpredictable

55. What is the effective atomic number of V in hexacarbonylvanadium(O)?
(A) 34 (B) 36
(C) 35 (D) 37

56. Which of the following salt on heating with con. Sulphuric acid gives violet vapours?
(A) Iodide salt (B) Nitrate salt
(C) Sulphate salt (D) Bromide salt

57. Which of the following metal salt on heating gives blue color in borax bead test?
(A) Fe (B) Ni
(C) Co (D) Mn

58. H_2S and SO_2 gases can be distinguished by
(A) Litmus paper (B) Lime water
(C) lead acetate paper
(D) HCl

59. Which of the following metal salt is colorless?
(A) Zn salt (B) Co salt
(C) Cr salt (D) Fe salt

60. No characteristic flame is given by
(A) $BaCl_2$ (B) NaCl
(C) $CaCl_2$ (D) $BeCl_2$

61. An oxalate salt gives which of the following gas in dry test tube
(A) CO (B) CO_2
(C) Oxalic acid vapour
(D) $CO+CO_2$

62. Which of the following metal salt is dark green in color?
(A) Zn salt (B) Cu salt
(C) Cr salt (D) Co salt

63. Which of the following metal salt liberate reddish brown gas on treatment with dilute con. Sulfuric acid?
(A) $ZnBr_2$ (B) KNO_2
(C) $BaCl_2$ (D) $BaSO_4$

64. When con. sulphuric acid is added to dry salt of KNO_3 brown fumes will be evolved. These fumes are due to
(A) NO (B) NO_2
(C) SO_2 (D) SO_3+SO_2

65. The chromyl-chloride test is given by which of the following anion?
(A) Iodide ion (B) Bromide ion
(C) Chloride ion (D) Nitrate ion

66. Which of the following gas turns lime water milky?
(A) NO (B) SO_2
(C) CO_2 (D) Both B and C

67. Which of the following salt is soluble in hot water but insoluble in cold water?
(A) $BaCl_2$ (B) $SrCl_2$
(C) $PbCl_2$ (D) $Hg(NO_3)_2$

68. Which of the following anion gives white ppt on heating with magnesium sulpahte solution?
(A) Crabonate (B) Nitrate
(C) Sulphite (D) Bicarbonate

69. Yellow ammonium sulphide solution is used to separate which of the following pair of species?
((A) CuS and PbS (B) PbS and Bi_2S_3
(C) CuS and Bi_2S_3 (D) CdS and As_2S_3

70. Which of the following anion is an interfering radical?
(A) Crabonate (B) Nitrate
(C) Phosphate (D) Sulphate

72. Which of the following basic radical gives red or brown ppt with Nessler,s reagent solution?
(A) K-ion (B) Na-ion
(C) Ca-ion
(D) Ammonium ion

73. Which of the following basic radical gives white ppt with potassium pyroantimunate solution?
(A) K-ion (B) Na-ion
(C) Ca-ion
(D) Ammonium ion

74. Which of the following basic radical gives rose red ppt with DMG solution?
(A) Zn-ion (B) Na-ion
(C) Ca-ion (D) Ni-ion

75. Which of the following basic radical gives lake test ?
(A) K-ion (B) Na-ion
(C) Ca-ion (D) Al ion

76. Which of the following basic radical gives brick red flame?
(A) K^+ (B) Na^+
(C) Ca^{++} (D) Zn^{++}

77. Which of the following basic radical gives green flame?
(A) K^+ (B) Na^+
(C) Ca^{++} (D) Ba^{++}

78. Which of the following basic radical gives violet flame?
(A) K^+ (B) Na^+
(C) Ca^{++} (D) Ba^{++}

79. Which of the following basic radical gives bliush flame?

(A) K^+ (B) Na^+
(C) Ca^{++} (D) Cu^{++}

80. Which of the following acid radical gives ring test?

(A) Carbonate (B) Sulpahte
(C) Bicarbonate (D) Nitrate

ANSWERS

1. A	2. B	3. A	4. A
5. B	6. D	7. B	8. A
9. D	10. D	11. A	12. B
13. A	14. A	15. C	16. D
17. D	18. A	19. A	20. C
21. A	22. B	23. D	24. A
25. C	26. C	27. D	28. B
29. B	30. B	31. B	32. A
33. C	34. C	35. C	36. A
37. D	38. D	39. D	40. D
41. C	42. B	43. A	44. B
45. A	46. B	47. C	48. D
49. A	50. D	51. A	52. A
53. B	54. C	55. C	56. A
57. C	58. C	59. A	60. D
61. D	62. C	63. C	64. B
65. C	66. D	67. C	68. D
69. D	70. C	71. C	72. D
73. B	74. D	75. D	76. C
77. D	78. A	79. D	80. D

4.1. FUNDAMENTALS OF ANALYTIC CHEMISTRY

1. The branch of chemistry which deals with the analysis of chemical products is known as
   (A) Physical chemistry
   (B) Organic chemistry
   (C) Inorganic chemistry
   (D) Analytical chemistry

2. The process of identifying the component present in a sample is called
   (A) Quantitative analysis
   (B) Qualitative analysis
   (C) Volumetric analysis
   (D) Gravimetric analysis

3. The process of determining amounts of each of the components in a sample of matter is termed as
   (A) Gravimetric analysis
   (B) Coulometric analysis
   (C) Quantitative analysis
   (D) Qualitative analysis

4. Which of the following physical properties is employed in the analytical methods?
   (A) Electric current
   (B) Transition temperature
   (C) Surface tension
   (D) All above

5. Gravimetric method is based on which of the following property?
   (A) Volume of a liquid
   (B) Volume of a gas
   (C) Mass of substance
   (D) Viscosity

6. Which property is used in volumetric methods of analysis
   (A) Density (B) Viscosity
   (C) Surface tension
   (D) Volume

7. Conductometry is based on
   (A) Electric current
   (B) Electrical potential
   (C) Dielectric constant
   (D) Electrical conductance

8. Potentiometry is based on the measurement of which physical property?
   (A) Electrical conductance
   (B) Electrical potential
   (C) Thermal conductance
   (D) Voltage

9. Coulometry is based on the measurement of
   (A) Electrical current
   (B) Electrical potential
   (C) Electrical conductance
   (D) Dielectric constant

10. The current-voltage characteristics forms the basis of
    (A) Thermal analysis
    (B) Potentiometry
    (C) Conductometry
    (D) Polarography

11. Which of the following technique is based on the absorption of light radiation?
    (A) Spectrophotometry
    (B) Colorimetry (C) NMR
    (D) All the above technique

12. Which of the following analytical technique is based on the emission of light radiation?
    (A) Flame photometry
    (B) Atomic absorption spectrophotometry
    (C) Raman spectroscopy
    (D) Conductometry

13. Which of the following analytical method is based on scattering of radiation?
(A) Emission spectroscopy
(B) Colorimetry (C) Polarimetry
(D) Turbidimetry (E) Paleography

14. Which of the following analytical method is based on the rotation of light radiation?
(A) Refractometry (B) Polarimetry
(C) Interferometry
(D) Mass spectrometry

15. Which of the following analytical technique is based on the refraction of radiation?
(A) Conductometry (B) Refractometry
(C) Coulometry (D) Polarography

16. Which of the following method of analysis is based on diffraction of radiation?
(A) Mass spectrometry
(B) Polarography (C) Potentiometry
(D) X-ray diffraction

17. Which of the following physical property forms the basis of radio chemical methods of analysis?
(A) Absorption of light
(B) Emission of light
(C) Scattering of light
(D) Radioactivity

18. Which of the following analytical technique is used for the separation of an interfering substance or analyte from the mixture?
(A) Precipitation (B) Distillation
(C) Electrode position
(D) All above these

19. Which of the following method is based on the solubility difference between the analyte and the unwanted components?
(A) Distillation
(B) Complex formation
(C) Electrodeposition
(D) Precipitation

20. Which of the following technique is based on deposition of the analyte at appropriate electrode by the passage of the electric current?
(A) Chromatography
(B) Dialysis (C) Electrodialysis
(D) Electrodeposition

21. Which of the following methods is the most common method for separation of liquid components from a mixture?
(A) Dialysis
(B) Solvent extraction
(C) Chromatography
(D) Distillation

22. Which of the following analytical method is used for the separation of dissolved components from solutions?
(A) Chromatography
(B) Dialysis
(C) Solvent extraction
(D) Electrophoresis

23. Which of the following analytical technique is used for separating similar substances by preferential adsorption or partition between two phases?
(A) Distillation (B) Dialysis
(C) Solvent extraction
(D) Chromatography

24. Which of the following technique is used to separate substances of high molecular weights (proteins, enzymes) of different charges?
(A) Dialysis
(B) Electrophoresis
(C) Solvent
(D) Distillation

25. Which of the following method is used to separate small molecules from the larger molecules in diffusing through a membrane?
(A) Dialysis
(B) Chromatography
(C) HPLC
(D) FPLC

26. Which of the following methods is chemical in nature?
(A) Acid-base titration
(B) Redox titration
(C) Precipitation titration
(D) All above methods

27. Which of the following technique/ method is not related to instrumental analysis?
(A) Optical method (B) Colorimetry
(C) Polarography
(D) Gravimetric analysis

28. Which of the following steps is not involved in chemical analysis?
(A) Separation of sample in pure form
(B) Separation of the sample in the mixture form
(C) Preparation of sample for the analysis
(D) Validity of experimental results

29. Which of the following quantity is correct for micro analysis?
(A) 1 – 10 mg or < 50 μL
(B) 10 – 20 mg or > 50 μL
(C) 50 – 100 mg or < 100 μL
(D) 100 – 1000 mg or > 1000 μL

30. Which of the following range of concentration is correct for semi-micro analysis?
(A) 10 – 1000 mg (B) 10 – 100 mg
(C) 1 – 10 mg (D) 20 – 1000 mg

31. Which of the following range is correct for macro analysis?
(A) Minimum 100 mg
(B) Minimum 10 mg
(C) Minimum 1 mg
(D) Minimum 1000 mg

32. A major constituent of material is one whose amount in the material is
(A) 1% or more (B) 0.1%
(C) 0.01% (D) 0.001%

33. A minor constant is one whose amount in the sample is
(A) 0.1 to 1% (B) 0.01 to 1%
(C) 1 to 10% (D) None of above

34. A trace constituent is one whose amount in the sample is
(A) < 10% (B) < 20%
(C) < 1.0% (D) < 0.01%

35. Which of the following steps is involved in quantitative analysis?
(A) Sampling
(B) Conversion of the desired constituent into a suitable form per analysis
(C) Measurement of some physical or chemical property, on which the determination is based
(D) All above steps

ANSWERS

1. D	2. B	3. C	4. D
5. C	6. D	7. D	8. B
9. A	10. D	11. D	12. A
13. D	14. B	15. B	16. D
17. D	18. D	19. D	20. D
21. D	22. C	23. D	24. B
25. A	26. D	27. D	28. B
29. A	30. B	31. A	32. A
33. B	34. D	35. D	

4.2. STATISTICAL TREATMENT OF ANALYTICAL DATA

1. The term accuracy refers to how near the observed value is to
   (A) Mean value (B) Low value
   (C) True value (D) None of above

2. Which of the following term refers to nearness between several measurements of the same quantity?
   (A) Accuracy (B) Precision
   (C) Standard error
   (D) Standard deviation

3. The digits which are necessary to express the result of a measurement to the precision with which the measurement is made are called
   (A) Non-significant figures
   (B) Mathematical figures
   (C) Significant figures
   (D) Significant errors

4. The number of significant figures in the number 0.216 is
   (A) 1 (B) 2
   (C) 3 (D) 4

5. The number of significance figures in the number 80.7 is
   (A) 1 (B) 2
   (C) 3 (D) 4

6. The proper number of significant figures in the number 0.0780 is
   (A) 3 (B) 4
   (C) 1 (D) 2

7. The number 8.47 is rounded to
   (A) 8.5 (B) 8.4
   (C) 8.7 (D) 8.6

8. The number 7.65 is rounded to
   (A) 7.7 (B) 7.6
   (C) 7.5 (D) 7.75

9. The number 7.43 is rounded to
   (A) 7.44 (B) 7.45
   (C) 7.4 (D) 7.3

10. The relative error is usually expressed as
    (A) Parts per ten (B) Parts per one
    (C) Parts per hundred
    (D) None of above

11. Deviation in a particular measurement, is the difference between the measured value and the average value. The arithmetic mean of the different deviations observed in several measurements of the same quantity is known as
    (A) The standard deviation
    (B) The average deviation
    (C) Relative mean deviation
    (D) Variance

12. The coefficient of variance (C.V.) is defined as
    (A) $C.V. = \frac{s \times 100}{\bar{x}}$ (B) $C.V. = \frac{\bar{x} \times 100}{s}$
    (C) $C.V. = \frac{\bar{x} \times s}{100}$ (D) $C.V. = \frac{s \times 1000}{\bar{x}}$

13. Suppose a sample is analysed for a particular constituent by two different methods. One can tell whether the two average values are significantly different by applying which of the following test?
    (A) Student's test (B) F test
    (C) Chi square test
    (D) Variance

14. If the values of standard deviations for the first and second method differ, then which of the following test helps

one to know whether this difference is significant

(A) Student's test
(B) F-test (C) Chi square test
(D) Standard deviation

15. Which of the following test is used to find out whether the observed data differ significantly from the one obtained from theoretical distribution?

(A) Chi square test
(B) F-test (C) Student's test
(D) Coefficient of variance

ANSWERS

1. D	2. B	3. C	4. C
5. C	6. A	7. A	8. B
9. C	10. D	11. B	12. A
13. A	14. B	15. A	

4.3. PRINCIPLES UNDERLYING ANALYTICAL OPERATIONS

1. The rate of a chemical reaction is proportional to the product of the active mass of the reactants. This is a statement of
   (A) Law of dynamic equilibrium
   (B) Le-Chatlier's principle
   (C) Law of mass action
   (D) Solubility product principle

2. Consider the following reaction
   $aA + bB \rightleftharpoons cC + dD$
   where a, b, c and d represent the number of moles of the reactants and products. The value of equilibrium constant K for this reaction is given as
   (A) $K = \frac{|A|^a \times |B|^b}{|C|^c \times |D|^d}$
   (B) $K = \frac{|C|^c \times |D|^d}{|A|^a \times |B|^b}$
   (C) $K = |A|^a \times |B|^b$
   (D) $K = |C|^c \times |D|^d$

3. The equilibrium constant value for a chemical reaction is 5×10^{20}, which of the following statement is true with respect to this value?
   (A) Reaction will be reversible
   (B) Reaction will proceed in backward direction
   (C) Reaction is at equilibrium
   (D) Reaction will proceed in the forward direction

4. If a chemical reaction in equilibrium is subjected to a change, the reaction tends to more in such a direction that the effect of the change would be neutralized. This is a statement of
   (A) Law of mass action
   (B) LeChatlier's principle
   (C) Henry's law
   (D) Correspondence principle

5. In order to increase the rate of the reaction, one should
   (A) Increase the concentration of products
   (B) Decrease the concentration of reactants
   (C) Increase the concentration of reactants
   (D) None of above

6. The relationship between free energy and equilibrium constant is given as
   $\Delta F = -RT \ln K$
   The reaction proceed in the forward direction only where
   (A) ΔF is positive (B) ΔF is negative
   (C) ΔF is zero
   (D) Value of K is smaller

7. Which of the following substance is not weak electrolyte?
   (A) CH_3COOH (B) NH_4OH
   (C) Oxalic acid (D) NaCl

8. Which of the following is not strong electrolytes?
   (A) HCl (B) H_2SO_4
   (C) HNO_3 (D) CH_3COOH

9. Which of the following species does not exist in aqueous solution of H_3PO_4?
   (A) $H_2PO_4^-$ (B) HPO_4^{2-}
   (C) PO_4^{3-} (D) OH^-

10. Which of the following statement is not correct regarding dissociation constant (Ka)?
   (A) It is a measure of the tendency of an acid to split up into ions
   (B) The grater the value of Ka, more is the dissociation
   (C) It is determined by conductiometric method
   (D) It is not a proper parameter for weak acids

11. In second group of inorganic qualitative analysis, the S^{2-} ions does not form precipitate with which of the following ions?
   (A) Hg^{2+} (B) Cu^{2+}
   (C) Pb^{2+} (D) Al^{3+}

12. When to a solution of weak electrolyte, a strong electrolyte with a common ion is added, the dissociation of weak electrolyte is suppressed. This is known as
   (A) Stark effect (B) Salt effect
   (C) Common ion effect
   (D) Zeeman effect

13. It is known that AgCl is insoluble in HNO_3 but dissolves readily in NH_4OH solution. Which of the following statement is not correct?
   (A) Ag^+ ion reacts to form complex with NH_4OH solution
   (B) The concentration of Ag^+ ion decreases
   (C) Ionic product is less than the solubility product
   (D) Ionic product is greater than solubility product

14. It has been observed that if one goes on adding KNO_3 solution to a precipitate of AgCl, the solubility of these precipitates goes on increasing with increasing concentration of K^+ and NO_3^- ions which are not common to AgCl. This is due to which effect
   (A) Divers ion effect
   (B) Uncommon ion effect
   (C) Activity effect (D) All above

15. The pH of 0.001 N HCl is
   (A) 1 (B) 2
   (C) 3 (D) 4

16. The pH of 0.01 N NaOH is
   (A) 12 (B) 13
   (C) 14 (D) 10

17. Which of the following combination is used to make buffer?
   (A) NaOH and HCl
   (B) KOH and H_2SO
   (C) CH_3COOH and CH_3COONa
   (D) CH_3COOH and NH_4OH

ANSWERS

1. C	2. B	3. D	4. B
5. E	6. B	7. D	8. D
9. D	10. D	11. D	12. C
13. C	14. D	15. C	16. A
17. C			

4.4. QUANTITATIVE INORGANIC ANALYSIS

1. Which of the following methods is used in qualitative analysis?
(A) Physical method
(B) Chemical method
(C) Instrumental method
(D) All above

2. Yellow colour of the flame is observed with
(A) Calcium salt (B) Barium salt
(C) Strontium slat (D) Sodium salt

3. Dull red flame is observed with
(A) Calcium salt (B) Barium salt
(C) Strontium salt (D) Sodium slat

4. Yellowish green flame is observed with
(A) Calcium salt (B) Barium salt
(C) Strontium salt (D) Potassium salt

5. Which of the following is not a physical test
(A) Colour test (B) Flame test
(C) Beed test (D) Wet test

6. Which of the following species is not a basic radical?
(A) Ag^{+} (B) Cl^{-}
(C) Ba^{++} (D) Al^{+++}

7. Which of the following is not an acid radical?
(A) Cl^{-} (B) Br^{-}
(C) I^{-} (D) K^{+}

8. Which of the following radical is not a member of II group?
(A) Cu^{2+} (B) Cd^{2+}
(C) Sb^{3+} (D) Bi^{3+}

9. Which of the following radical is not a member of III group?
(A) Al^{3+} (B) Fe^{2+}
(C) Fe^{3+} (D) Ca^{2+}

10. Which of the following radical is not a member of IV group?
(A) Mg^{2+} (B) Co^{2+}
(C) Ni^{2+} (D) Zn^{2+}

11. Which of the following radical is a member of VI group?
(A) Mg^{2+} (B) Na^{+}
(C) K^{+} (D) All above

12. Which of the following group reagent is used for III group of basic radical?
(A) Dilute HCl (B) H_2S + HCl
(C) $NH_4OH + NH_4Cl$
(D) $NH_4OH + H_2S$

13. NH_4OH in the presence of H_2S is used as a group reagent for which of the following group?
(A) Group I (B) Group II
(C) Group III (D) Group IV

14. Which of the following chloride is soluble in hot water?
(A) Hg_2Cl_2 (B) AgCl
(C) $PbCl_2$ (D) All above

15. Which of the following sulphide is yellow in colour?
(A) HgS (B) PbS
(C) CuS (D) CdS

16. Which of the following salt is colourless?
(A) Zn salt (B) Co slat
(C) Ni salt (D) Cr salt

17. Which of the following salt is soluble in water?
(A) $BaCO_3$ (B) $SrCO_3$
(C) $CaCO_3$ (D) K_2CO_3

18. Which of the following salt is water insoluble?
(A) K_2SO_4 (B) Na_2SO_4
(C) $(NH_4)_2SO_4$ (D) $BaSO_4$

19. Which of the following acid radical is not interfering?
(A) Phosphate (B) Borate
(C) Flouride (D) Sulphate

20. Which of the following extract is used for wet tests of acid radicals?
(A) Calcium carbonate extract
(B) Sodium iodide extract
(C) Potassium carbonate extract
(D) Sodium carbonate extract

21. Cobalt salts imparts which colour to the borax bead?
(A) Blue
(B) Yellowish brown
(C) Green (D) Red

22. Which of the following hydroxide is gelatinous in nature?
(A) $Fe(OH)_3$ (B) $Al(OH)_3$
(C) $Cr(OH)_3$ (D) $Be(OH)_2$

23. Which of the following acid radical gives chromyl chloride test?
(A) I^- (B) Br^-
(C) F^- (D) Cl^-

24. A mixture containing S^{2-} and SO_3^{2-} ions on treating with dil.HCl will produce
(A) H_2S gas (B) SO_2 gas
(C) CO_2 gas (D) H_2S and SO_2 gas

25. Which of the following salt is green in colour?
(A) Mn salt (B) Cr salt
(C) Co salt (D) Ba salt

26. Which of the following acid radical give organic layer test?
(A) Cl^- (B) CO_3^{2-}
(C) SO_4^{2-} (D) I^-

ANSWERS

1. D	2. D	3. A	4. B
5. D	6. B	7. D	8. D
9. D	10. A	11. D	12. C
13. D	14. C	15. D	16. A
17. D	18. D	19. D	20. D
21. A	22. B	23. D	24. D
25. B	26. D		

4.5. ATOMIC SPECTROSCOPY

1. Which of the following analytical technique is not concerned with atomic spectroscopy?
   (A) Flame photometry
   (B) Flame emission spectrometry
   (C) Atomic absorption spectrometry
   (D) IR spectrophotometry

2. Which of the following technique has flame as a source of excitation energy?
   (A) UV-spectroscopy
   (B) IR-spectroscopy
   (C) Flame photometry
   (D) Raman spectroscopy
   (E) NMR spectroscopy

3. Which of the following statements is not true with respect to atomic spectroscopy?
   (A) Atoms are simplest form of matter
   (B) Atoms cannot rotate or vibrate as molecules do
   (C) Only electronic transitions within atoms take place
   (D) Band spectra are observed

4. The emission of light characteristics of metal and correlation of intensity of the light emitted with concentration of that metal forms the basis of
   (A) Raman spectroscopy
   (B) IR spectroscopy
   (C) Flame photometry
   (D) Rotational spectroscopy

5. Which of the following statements is not related with flame photometric analysis?
   (A) Vaporization of the solvent leaving back the residue
   (B) Conversion of solid salt to the gaseous state
   (C) Dissociation of gaseous molecules into free atoms
   (D) Measurement of the intensity of absorbed radiation

6. The relative populations of ground state and excited state populations at a given flame temperature can be estimated using
   (A) Boltzmann distribution law
   (B) Maxwell law (C) Lambert's law
   (D) Beer's law

7. Which of the following fuel is used in flame photometry?
   (A) Hydrogen gas (B) Acetylene gas
   (C) Methane (D) All above

8. Which of the following is not a component of flame photometer?
   (A) Pressure regulator and flow meter
   (B) The atomizer (C) The burner
   (D) Hallow cathode lamp

9. Which of the following statements is not correct with respect to errors in flame photometry?
   (A) Errors rising form the phenomena developed in the Hollow cathode lamp
   (B) Background effect
   (C) Errors arising from test element itself
   (D) Spectral interferences

10. Which of the following statements is not correct with respect to limitations of flame photometry?
   (A) Low energy of the exciting source
   (B) Liquid samples are generally used
   (C) Cannot be applied for direct determination of all metals
   (D) Can be employed for direct detection of halides or inert gases

11. Which of the following element is usually determined by flame photometry?
(A) Li (B) Na
(C) K
(D) All above elements

12. Beer's law is followed in
(A) Flame photometry
(B) Atomic absorption spectrophotometry
(C) Mass spectrometry
(D) Potentiometry

13. The absorbance is directly proportional to the path length in the flame and to the concentration of atomic vapor in flame, is a statement of
(A) Lambert's law (B) Beer's law
(C) Henry's law (D) Starke law

14. The light source in AAS used is
(A) Uv-light (B) Visible light
(C) Radio waved
(D) Hollow cathode lamp

15. Which of the following is not a component of hollow cathode lamp?
(A) Anode (B) Cathode
(C) Filter gas
(D) Quartz window

16. Which of the following is not a component of AAS?
(A) Hollow cathode lamp
(B) Burner
(C) Monochromater
(D) Tungsten lamp

17. Which of the following mixture is used as most popular flame in AAS?
(A) Acetylene-air
(B) Acetylene-O_2
(C) Acetylene-Norous oxide
(D) Hydrogen-air

18. The concentration required to give a signal equal to three times the standard deviation of the baseline (blank) is called
(A) Sensitivity
(B) Detection limit
(C) Signal to noise ratio
(D) None of the above

19. Which of the following technique is most sensitive one?
(A) Photometry (B) AAS
(C) Flame photometry
(D) Flourimetry

20. The instrument used for measuring fluorescence is known as
(A) Fluorimeter (B) Potentiometer
(C) Flame photometer
(D) Mass spectrometer

21. Which of the following source is commonly used as excitation source in fluorimeter?
(A) Tungsten lamp
(B) Mercury vapour lamp
(C) Nernst vapour lamp
(D) Radio souse

ANSWERS

1. D	2. C	3. D	4. C
5. D	6. A	7. D	8. D
9. A	10. D	11. D	12. B
13. B	14. D	15. B	16. D
17. A	18. B	19. D	20. A
21. B			

4.6. SEPARATION TECHNIQUES

1. Which of the following techniques is used for cleanup of samples prior to introduction into chromatographic column?
   (A) Solid phase extraction
   (B) TLC (C) HPLC
   (D) GC

2. Which of the following techniques involves the distribution of solute between two immiscible liquid phases?
   (A) Chromatography
   (B) Electrophoresis
   (C) Solvent extractions
   (D) Solid-phase extraction

3. Which of the following techniques involves the bonding of hydrophobic functional groups to solid particle, surface and acts as extracting phase?
   (A) Liquid-phase extraction
   (B) Solid-phase extraction
   (C) Electrophoresis
   (D) Paper chromatography

4. Which of the following techniques is used to reduce the need for large volumes of organic solvents?
   (A) Solid-phase extraction
   (B) Gel permeation
   (C) Electrophoresis (D) TLC

5. When a solute is dissolved in two immiscible solvents, it will distributes itself between two phases and the ratio of the concentration of the solute in two phases will be constant. This is known as
   (A) Starke law
   (B) Distribution law
   (C) Equilibrium law
   (D) Snell's law

6. Which of the following techniques is useful to remove metal ions from an interfering matrix?
   (A) Solvent extraction
   (B) Electrophoresis
   (C) Cataphoresis
   (D) Gel permeation

7. The most widely used method of extracting metal ions is the formation of a chelate molecule with an organic chelating agent. The chelating agents are
   (A) Strong acids (B) Strong bases
   (C) Weak bases (D) Weak acids

8. Which of the following interaction is involved in solid-phase extraction technique?
   (A) Van der Waals forces
   (B) Dipolar attraction
   (C) H-bonding (D) All of above

9. Which of the following extractant is used in solid-phase extraction?
   (A) Bonding of C_{18} chains on silica
   (B) Bonding of C_{20} on paper
   (C) Bonding of C_{18} on glass
   (D) Bonding of C_{20} on cellulose

10. Besides the common silica-based SPE particles, polymer supports are also available. They have advantages over silica based SPE particles. Which of the following reason is possible?
    (A) These are stable over a wide pH range
    (B) These do not possess residual silica groups
    (C) The particles are spherical
    (D) All above

11. Solid-phase microextraction is a solvent less extraction technique. This technique is used for preparation of samples for analysis by which of the following technique?
(A) HPLC (B) GC
(C) TLC
(D) Paper chromatography

12. The term chromatography was coined by which of the scientist?
(A) J.P. Martin (B) L.M. Synge
(C) A.T. James (D) M. Tsvet

13. The chemical method of separation in which the analytes to be separated are distributed between two phases, one of which is stationary phase, while the other moves in a definite direction. This technique is known as
(A) Electrophoresis
(B) Chromatography
(C) Solvent extraction
(D) Solid-phase extraction

14. Which of the following techniques does not belong to column chromatography?
(A) Size exclusion (B) HPLC
(C) TLC
(D) Electrophoresis

15. Which of the following basic process is involved in the separation of the complex mixture by chromatographic techniques?
(A) Partition (B) Adsorption
(C) Ion exchange (D) All of above

16. TLC belongs to which of the following chromatographic techniques.
(A) Ion exchange
(B) Partition chromatography
(C) Adsorption chromatography
(D) Gel permeation

17. In normal mode of operations of liquid-liquid partition, a polar stationary phase (methanol on silica) is used with a non-polar mobile phase. Which of the following solvent is used as mobile phase?
(A) Ethanol (B) Propanol
(C) Butanol (D) Hexane

18. In reverse-phase chromatography, which of the analyte will be retained more on the stationary phase?
(A) Semi-polar (B) Non-polar
(C) Polar (D) None of above

19. In reverse-phase chromatography, which of the analyte will be eluted more readily?
(A) Polar (B) Non-polar
(C) Semi-polar (D) All above

20. Which of the following techniques involves ion-exchange phenomenon?
(A) Size exclusion chromatography
(B) Ion exchange chromatography
(C) GLC (D) HPLC

21. In which of the following techniques, the solvated molecules are separated according to their size by their ability to penetrate a sieve like structure?
(A) Adsorption chromatography
(B) Partition chromatography
(C) Ion-exchange chromatography
(D) Gel-permeation chromatography

22. Which of the following techniques involves gas as the mobile phase?
(A) HPLC (B) GLC
(C) Paper chromatography
(D) TLC

23. The separation efficiency of a column can be expressed in terms of number of
(A) Solvents used
(B) Theoretical plates
(C) Stationary phases
(D) Mobile phases

24. A theoretical plate in chromatography is represented by how many equilibrium step
(A) One (B) Two
(C) Three (D) Four

25. The plate height is the length of the column divide by
(A) Length of the column
(B) Width of the column
(C) Number of theoretical plates
(D) Number of components of the mixture

26. Which of the following expression is used to calculate the number of plates?
(A) $N = 14\left(\frac{t_g}{w_b}\right)$ (B) $N = 16\left(\frac{t_g}{w_b}\right)$
(C) $N = 16\left(\frac{t_g}{w_b}\right)^2$ (D) $N=10\left(\frac{t_g}{w_b}\right)^2$

27. Which of the following factor is involved in band boarding that occurs in column chromatography?
(A) Number of theoretical plates
(B) Eddy diffusion
(C) Molecular diffusion
(D) All above

28. Which of the following techniques is used for separation of volatile components?
(A) GC (B) HPLC
(C) FPLC (D) TLC

29. Which of the following techniques is used for the separation of macromolecules/ polymers?
(A) Size exclusion chromatography
(B) GLC (C) HPLC
(D) TLC

30. Which of the following techniques is used to separate a mixture of cations?
(A) GC (B) FPLC
(C) Ion-exchange chromatography
(D) Size exclusion chromatography

31. The exchange equilibrium in gas chromatography depends on
(A) Solubility or adsorbability of the sample
(B) The polarity of the stationary phase and analyte
(C) The degree of H-bonding
(D) All above factors

32. Which of the following is not a component of a gas chromatography system?
(A) Carrier gas
(B) Capillary column
(C) Packed column (D) Cathode lamp

33. Which of the following gas is not used as carrier gas in GC?
(A) Argon (B) Nitrogen
(C) Helium (D) CO_2

34. Which of the following range is usually used for liquid samples in packed column in GC?
(A) 10 – 20 μl (B) 20 – 50 μL
(C) 50 – 100 μL (D) 0.1 – 10 μL

35. Which of the following information is correct about a Typical packed column in GC?
(A) 10 – 100 m long and 2 to 6 cm in diameter
(B) 1 – 10 m long and 0.2 to 0.6 cm in diameter
(C) 0.1 – 1 m long and 0.02 to 0.06 cm in diameter
(D) None of the above

36. A well-packed column may have
(A) 100 plates/m (B) 10 plates/m
(C) 1000 plates/m
(D) 10,000 plates/m

37. Which of the following detector is used in GC analysis
(A) Thermal conductivity detector
(B) Flame ionization detector
(C) Mass spectrometer
(D) All above

38. Which of the following detector is used for compounds containing electronegative atoms?
(A) Mass spectrometer
(B) Uv-detector (C) ECD
(D) TCD (E) β-ray detector

39. Which of the following detector is used in HPLC system?
(A) Differential refractometer detector
(B) UV detector
(C) Diode array detector
(D) All above

40. Which of the following technique is used to separate substances based on their charge to mass ratio?
(A) HPLC (B) HPTLC
(C) FPLC
(D) Electrophoresis

41. Which of the following techniques is capable of seperating minute quantities of the substances in a relatively short times with high resolution?
(A) Gel electrophoresis
(B) Capillary electrophoresis
(C) GC (D) HPLC

42. Which of the following materials is not suitable as adsorbent for chromatography?
(A) Silica gel
(B) Activated charcoal
(C) Alumina
(D) Calcium chloride

43. Which of the following statements is not related with the advantages of TLC?
(A) A variety of adsorbents can be used
(B) The thickness of adsorbent can be varied
(C) Fluorescence can be introduced
(D) Different detectors can be used

44. Which of the following functional groups is not involved in ion-exchange chromatography?
(A) Weak acids (B) Strong acids
(C) Strong bases (D) Carbohydrates

45. Which of the followings is not a component of HPLC system?
(A) Pumps (B) Columns
(C) Particle collector
(D) Injection system

ANSWERS

1. A	2. C	3. B	4. A
5. B	6. A	7. D	8. D
9. A	10. D	11. B	12. D
13. B	14. D	15. D	16. C
17. D	18. B	19. A	20. B
21. D	22. B	23. B	24. A
25. C	26. C	27. D	28. A
29. A	30. C	31. D	32. D
33. D	34. D	35. B	36. C
37. D	38. C	39. D	40. D
41. B	42. D	43. D	44. D
45. C			

4.7. VOLUMETRIC METHODS OF ANALYSIS

1. An acid-base titration involves a neutralization reaction in which an acid is reacted with an equivalent amount of base. The titrant is always a strong acid or base. The analyte may be
   (A) Strong acid (B) Strong base
   (C) Weak base (D) All above

2. Considering the titration of HCl with NaOH, which of the statement is not correct?

   $$H^+ + Cl^- + Na^+ + OH^- \longrightarrow H_2O + Na^+ + Cl^-$$

   (A) The H^+ and OH^- combine to form H_2O
   (B) Na^+ and Cl^- remain unchanged
   (C) Na^+ and Cl^- combine to form NaCl
   (D) It is a neutralization reaction

3. The point at which the reaction is observed to be complete is called
   (A) The equivalence point
   (B) The end point
   (C) The triplet point
   (D) The equilibrium point

4. An indicator for an acid-base titration is a
   (A) Weak acid (B) Weak base
   (C) Strong acid (D) Both A and B

5. When HCl is titrated against NaOH, the pH at the equivalence point is
   (A) Zero (B) > 7
   (C) < 7 (D) 14

6. When CH_3COOH is titrated against NaOH, the pH as the equivalence point is
   (A) 7 (B) < 7
   (C) > 7 (D) 6.8

7. Which of the following is the best indicator for titration of CH_3COOH with NaOH?
   (A) Methyl orange
   (B) Methyl red
   (C) Phenolphthalein
   (D) Eosin

8. Which of the following is the best indicator for titration of NH_4OH with HCl?
   (A) Methyl red (B) Methyl orange
   (C) Phenolphthalein
   (D) Eosin

9. Amino acids are important in biochemistry. Which of the following statements is not correct regarding amino acids?
   (A) These are amphotreic substances
   (B) In aqueous solutions, these substances tend to undergo internal proton transfer
   (C) These for zwitter ion in aqueous medium
   (D) These always contain two amino groups

10. Complexing reactions are useful for which of the following method of analysis?
    (A) Gravimetry
    (B) Spectorphotometry
    (C) Fluorometry (D) All of above

11. Which of the following species is determined by complexometric titrations?
    (A) K^+ (B) Na^+
    (C) Cl^- (D) Ca^+

12. The number of bonds formed by the central atom is called its
(A) Valence number
(B) Complex number
(C) Coordination number
(D) Avogadro's number

13. Which of the following is not a ligand or complexing agent?
(A) NH_3 (B) CH_3COOH
(C) EDTA (D) CN^-

14. Which of the following analytical techniques can be used to extract metal ion chelates?
(A) Solvent extractions
(B) Evaporation (C) Sublimation
(D) GC

15. Which of the following metal ion cannot be estimated by gravimetric analysis?
(A) K^+ (B) Ca^{2+}
(C) Al^{3+} (D) Ni^{2+}

16. Which of the following anionic species is not separated by gravimetric analysis?
(A) Cl^- (B) PO_4^{-3}
(C) SO_4^{2-} (D) CH_3COO^-

17. Which of the following is not an organic precipitating agent?
(A) Diemethlglyoxime
(B) Cuperon (C) Oxime
(D) Acetate

18. Which of the following is not an adsorption indicator?
(A) Eosin
(B) Bromocresol green
(C) Fluorescein
(D) Phenolphthalein

19. Which of the following adsorption indicator is used for any of the halides at pH 7 ?
(A) Fluorescein (B) Eosin
(C) Thorin
(D) Rhodamine 6 G

20. The oxidation number of Mn in $KMnO_4$ is
(A) +5 (B) +6
(C) +7 (D) +3

21. The titration involving oxidation-reduction reactions is called
(A) Complex titration
(B) Simplex titration
(C) Redox titration
(D) Acid-base titration

22. Which of the following techniques describes titrations in which a standard iodine solution is need?
(A) Iodometry (B) Iodimetry
(C) Potentiometry (D) Argentometry

ANSWERS

1. D	2. C	3. B	4. D
5. B	6. C	7. C	8. A
9. D	10. D	11. D	12. C
13. B	14. A	15. A	16. D
17. D	18. D	19. A	20. C
21. C	22. B		

4.8. ELECTROANALYTICAL TECHNIQUES

1. Which of the following cells is used to produce electricity from chemical reaction?
   (A) Electrolytic cell
   (B) Fuel cell (C) Galvanic cell
   (D) None of Above

2. Which of the following allows charge transfer through the solution but prevents mixing of the solution?
   (A) Anode (B) Cathode
   (C) Electrode cell (D) Salt bridge

3. Which of the following device is used to measure potential difference between electrodes?
   (A) Polarimètre (B) Conductometer
   (C) Voltmeter (D) Photometer

4. Which of the following half reaction has been assigned a value of 0.00 V?
   (A) $Zn^{2+} + 2e^- \rightleftharpoons Zn$
   (B) $Sn^{4+} + 2e^- \rightleftharpoons Sn^{2+}$
   (C) $2H^+ + 2e^- \rightleftharpoons H_2$
   (D) $Fe^{3+} + e^- \rightleftharpoons Fe^{2+}$

5. The relationship between standard cell potential and free energy is given by
   (A) $\Delta F = -nF\Delta E°$ (B) $\Delta F° = -nF\Delta E°$
   (C) $\Delta F° = nF\Delta E°$ (D) $\Delta F = nF\Delta E$

6. Which of the following species is very good oxidizing agent?
   (A) MnO_4^- (B) H^+
   (C) Zn^{2+} (D) Fe^{3+}

7. Which of the following species is very poor oxidizing agent?
   (A) H^+ (B) Zn^{2+}
   (C) Fe^{3+} (D) MnO_4^-

8. Which of the following statement is not true with respect to electrode potential?
   (A) Feasibility of a chemical reaction
   (B) Rate of a chemical reaction
   (C) Nature of a chemical reaction
   (D) Free energy of a chemical reaction

9. The Nerst equation for half-cell potential is
   (A) $E = E° - \frac{2.303\ RT}{F} \log \frac{1}{a}$
   (B) $E = -\frac{2.303\ RT}{F} \log a$
   (C) $E = E° + \frac{2.303\ RT}{F} \log a$
   (D) $E = E° - \frac{2.303\ RT}{F} \log a$

10. Which of the following electrode is normally used as reference electrode for a potentiometer?
    (A) Platinum electrode
    (B) Calomel electrode
    (C) Silver electrode
    (D) Copper electrode

11. Which of the following salt is not used in slat bridge to minimize liquid junction potential?
    (A) KCl (B) NH_4Cl
    (C) KNO_3 (D) $CaCl_2$

12. Which of the following device is employed for cell potential measurement?
    (A) Polarimeter
    (B) Potentiometer
    (C) Conductivity metre
    (D) Ammetre

13. Which of the following equation is employed to determine cell potential and equilibrium constant?
(A) $K = \frac{RT}{nF} \ln E^\circ$ (B) $E^\circ = \frac{nF}{RT} \ln K$
(C) $E^\circ = \frac{RT}{nF} \ln K$ (D) $E = \frac{RT}{F} \ln K$

14. Which of the following is not a redox indicator?
(A) Ferroin
(B) Diphenylamine
(C) Phenolphthalein
(D) Methyl blue

15. Which of the following technique is current-voltage technique?
(A) Amperometry (B) Voltammetry
(C) Potentiometry (D) Polarography

16. Which of the following technique is the application of voltametry at a fixed potential to detect changes in the currents as a function of the concentration of the analyte
(A) Amperometry (B) Coulometry
(C) Polarography (D) Potentiometry

17. Voltametric technique using a dropping mercury electrode is called
(A) Amperometry (B) Coulometry
(C) Polarography (D) Potentiometry

18. The technique which involves the equivalence relation between the quality of electric current passed and quantity of chemical change taking place in the electrochemical cell is called
(A) Voltametry (B) Coulometry
(C) Polarography (D) Potentiometry

19. The technique which involves measurement of the changes in conductance of the solution by employing high frequency alternating current is known as
(A) Potentiometry (B) Polarography
(C) Oscillometry
(D) Conductometry

20. In TGA, the width loss curve depends on the which instrumental factors?
(A) Furnace heating rate
(B) Recording or chart speed
(C) Furnace atmosphere
(D) All above

21. The sample characteristics affecting the weight loss curve include
(A) Amount of sample
(B) Solubility of evolved gases in the sample
(C) Sample particle size
(D) All above

22. In DTA, thermal effects may be exothermic or endothermic. These are cause by
(A) Fusion
(B) Crystal structure inversion
(C) Boiling and sublimation
(D) All above

23. The property measured in TGA is
(A) Change in weight
(B) Rate of change in weight
(C) Heat evolved and absorbed
(D) Change of temperature

24. The common temperature detecting devices in DTA are
(A) Thermocouples (B) Thermopiles
(C) Thermistors (D) All

25. Thermocouples have been constructed from
(A) Chromel vs elumel
(B) Copper vs platinum
(C) Both (D) None

26. The property associated in thermometric titration is
(A) Change in weight
(B) Rate of change in weight
(C) Heat evolved or absorbed
(D) Change in temperature

27. DTA is of great importance in which of the following field
(A) Ceramic (B) Metallurgy
(C) Mineralogy (D) All

28. Which of the following is a thermometric method?
(A) TGA (B) DTA
(C) DTG (D) All above

29. The property measured in DTA is
(A) Heat effects (B) Weight loss
(C) Rate of change in weight
(D) Change in temperature

30. Thermogravimetric analysis has applications in which of the following fields?
(A) Gravimetric analysis
(B) Discovery of new methods of separation
(C) Determination of purity and thermal stability
(D) All above

ANSWERS

1. C	2. D	3. C	4. C
5. B	6. A	7. B	8. B
9. A	10. B	11. D	12. B
13. C	14. C	15. B	16. A
17. C	18. B	19. C	20. D
21. D	22. D	23. A	24. D
25. C	26. D	27. D	28. D
29. A	30. D		

4.9. GENERAL ANALYTICAL TECHNIQUES

1. If the peak asymmetry factor value is <1, it indicates
   (A) Tailing peak (B) Fronting peak
   (C) Symmetrical peak
   (D) Ideal Peak

2. BET method for measuring surface area of stationary phase was discovered by?
   (A) Bruner (B) Emmett
   (C) Michael Faraday (D) All above

3. Which of following radiation are weakest in energy?
   (A) Microwave (B) X-Rays
   (D) UV (D) Visible

4. Which of following color has highest energy?
   (D) Blue (D) Green
   (C) Violet (D) Red

5. Infrared spectroscopy provides valuable information about?
   (D) Alkyl
   (B) Molecular weight
   (C) Functional group
   (D) Conjugation

6. The following symbol represents



   (A) Miscellaneous danger
   (B) Oxidant (C) General danger
   (D) Inhalation hazard

7. The following symbol represents



   (A) Miscellaneous danger
   (B) Oxidant
   (C) General danger
   (D) Inhalation hazard

8. The following symbol represents



   (A) Miscellaneous danger
   (B) Oxidant
   (C) General danger
   (D) Inhalation hazard

9. The following symbol represents



   (A) Miscellaneous danger
   (B) Oxidant
   (C) General danger
   (D) Inhalation hazard

10. If a molecule moves from a ground state of $E_1V_2R_0$ to $E_1V_3R_1$, it absorbs ———— radiations?
    (A) Microwave (B) IR
    (C) UV (D) Visible

11. Which of following is/are ionizing radiation/s?
    (A) Microwave (B) Gamma rays
    (C) Radiowaves (D) Visible

12. Which of following molecule do not absorb in the IR region?
    (A) HCl (B) ICl
    (C) HBr (D) N_2

13. The impinging electrons strike with enough energy to eject ——— secondary electrons in PMT?
(A) 3-6 (B) 2-5
(C) 1-5 (D) 1-4

14. Following spectra cannot be of?
(A) Methyl alcohol (B) Ethyl alcohol
(B) Carbonyl compound
(D) Propyl alcohol

15. A blue green band appears during separation of plant pigment. This band is due to presence of?
(A) Carotene (B) Xanthophyll
(C) Chlorophyll a (D) All above

16. What is most important in analytical laboratory?
(A) Cleanness
(B) Temperature control
(C) Environment (D) Safety

17. Electromagnetic radiations move in which plane:
(A) Horizontal (B) Vertical
(B) Both (D) Outward

18. In the first chromatography experiment by Tswett separated?
(A) Xyanothophyll (B) Beta carotene
(C) colors (D) Chlorophyll

19. Fluid entering a column is known as?
(A) Eluate (B) Elution
(C) Eluent
(D) Chromatography

20. In case of counter ions with ——— charge anion exchangers are used.
(A) Positive (B) Negative
(C) Neutral (D) Both A and B

21. Which of following type of chromatography involves electric current?
(A) Electrophoresis (B) Ion exchange
(C) Column (D) Paper

22. Which radiations are due to vibrational changes?
(A) UV (B) Visible
(C) Infrared (D) Microwave

23. A moving electric charge ——— produces magnetic fields?
(A) does not (B) Rarely
(C) Always (D) Sometimes

24. Which of following spectroscopic region is just above (stronger) the region in which we can see?
(A) UV (B) Visible
(C) Infrared (D) Laser

25. Electronic excitations are studied using
(A) UV (B) Visible
(C) Fluorescence (D) All above

26. Which of following have maximum number of energetic states?
(A) Crystals (B) Atoms
(C) Molecules (D) None of abobe

27. Which of following is strongest?
(A) X-rays (B) Gamma rays
(C) Microwaves (D) IR radiation

28. If transmission is 100% absorption will be?
(A) 0% (B) 10%
(C) 50% (D) 80%

29. Solvent effect is more pronounced in ——— compounds.
(A) Aldehyde (B) Ketone
(C) Ester (D) Carbonyl

30. The light source in visible spectrophotometer is:
(A) Tungsten lamp (B) Mercury
(C) Hydrogen gas lamp
(D) Deuterium discharge lamp

31. Hypochromic effect cause?
(A) shift to longer λ
(B) shift to shorter λ
(C) an increase in intensity
(D) a decrease in intensity

32. Single band near 3000cm^{-1} is a specific band for identification of?
(A) Alcohols (B) Alkanes
(C) Alkenes (D) Amine

33. The atoms of the molecules do not move during electronic transitions.
(A) Beer-Lamberts Law
(B) Maxwell Principle
(C) Faraday Principle
(D) Frank-Condon Principle

34. n →π* Transition are possible in molecules having electrons?
(A) Bonding electron only
(B) Non-bonding (C) σ bond
(D) π bond

35. ——— disperses the polychromatic radiation into bands of monochromatic radiation?
(A) Prism (B) Grating
(C) chopper (D) Both A and B

36. Mid IR region ranges from?
(A) 14000-400cm^{-1} (B) 400-10cm^{-1}
(C) 6000-400cm^{-1} (D) 4000-400cm^{-1}

37. Nuclear quantum transition is involved in emission of?
(A) X-rays (B) Gamma rays
(C) Microwaves (D) IR radiation

38. What is right way to take square root in excel?
(A) SQRT (B) =SQRT
(C) = Squareroot (D) Squareroot

39. Which of following is key number?
(A) 958765 (B) 0.09000
(C) 460.578 (D) 0.053020

40. Tswett used ——— as a stationery phase to separate chlorophyll?
(A) $CaCl_2$ (B) $CaCO_3$
(C) $Ca(OH)_2$ (D) CaO

41. A moving electric charge ——— produces magnetic fields?
(A) does not (B) Always
(C) Rarely (D) Sometimes

42. Following command is used to calculate standard deviation in a excel sheet cell:
(A) STD (B) STDV
(C) STDVE (D) STDEV

43. Give answer to maximum number of significant figures: 50.00 × 27.8 × 0.1167?
(A) 162.213 (B) 162.0
(C) 162.20 (D) None

44. What is answer according to rules of significant figures: 76.98765 + 24?
(A) 100.9 (B) 100.98
(C) 100.9876 (D) 100

45. Find median from following numbers, 1, 2, 3, 4, 8, 6, 5, 3?
(A) 3 (B) 4
(C) 8 (D) 3.5

46. In the first chromatography experiment by Tswett, he had used ——— as a stationery phase to separate chlorophyll?
(A) $CaCO_3$ (B) $Ca(OH)_2$
(C) $CaCl_2$ (D) CaO

47. Fluid entering a column is known as?
(A) Eluent (B) Elution
(C) Eluate
(D) Chromatography

48. Which of following have maximum number of energetic states?
(A) Crystals (B) Atoms
(D) Molecules (D) None of above

49. The light source in visible spectrophotometer is:
(A) Tungsten lamp (B) Mercury
(C) Hydrogen gas lamp
(D) Deuterium discharge lamp

50. The polar solvents shift the ——— bands to longer wavelength and the

______ band to a shorter wavelength.
(A) $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ (B) $n \rightarrow \pi^*$, $\pi \rightarrow \pi^*$
(B) $\pi \rightarrow \pi^*$, $n \rightarrow n^*$ (D) $\pi \rightarrow \pi^*$, $n \rightarrow \sigma^*$

51. Which radiations are also known as inner shell radiations?
(A) UV (B) Visible
(C) Infrared (D) X-rays

52. ______ is/are allowed transitions?
(A) $\pi \rightarrow \sigma^*$ (B) $\sigma \rightarrow \sigma^*$
(C) $\pi \rightarrow \pi^*$ (D) B and C

53. Hypochromic effect cause?
(A) shift to longer λ
(B) shift to shorter λ
(C) an increase in intensity
(D) a decrease in intensity

54. ______ disperses the polychromatic radiation into bands of monochromatic radiation?
(A) Prism (B) Grating
(C) Chopper (D) A and B

55. An analysis is based on following step/s or operation/s:
(A) The particular problem
(B) Apparatus and instrument
(C) your expertise (D) All above

56. In the first chromatography experiment by Tswett, he had used ______ as a stationery phase to separate chlorophyll?
(A) $CaCl_2$ (B) $Ca(OH)_2$
(C) $CaCO_3$ (D) CaO

57. Fluid entering a column is known as?
(A) Eluate (B) Elution
(C) Eluent
(D) Chromatography

58. In case of counter ions with ______ charge cation exchangers are used.
(A) Positive (B) Negative
(C) Neutral (D) A and B

59. Which of following is a type of plane chromatography?
(A) Electrophoresis (B) Ion exchange
(C) Column (D) Paper

60. Which radiations are also known as inner shell radiations?
(A) UV (B) Visible
(C) Infrared (D) X-rays

61. The λ_{max} of following compound ( ) according to Woodward rules is
(A) 230nm (B) 268nm
(C) 239nm (D) 241nm

62. The λ_{max} of following compound ( )according to Woodward rules is
(A) 230nm (B) 268nm
(C) 239nm (D) 241nm

63. The λ_{max} of following compound ( ) according to Woodward rules is
(A) 283nm (B) 268nm
(C) 239nm (D) 241nm

64. The λ_{max} of following compound ( )according to Woodward rules is
(A) 230nm (B) 268nm
(C) 234nm (D) 241nm

65. Volumetric pipettes can be?
(A) TC or TD (B) Only TC
(C) Only TD
(D) TC and Multi-volumetric

66. Which of following are weighed in weighing bottle?
(A) Hygroscopic (B) Liquids
(C) Non-metals (D) All

67. Hygroscopic chemicals can be used as?
(A) Primary standards
(B) Secondary standards
(C) Primary and secondary standards
(D) None of the above

68. Which of following laboratory material has highest working temperature?
(A) Borosilicate (B) Quartz glass
(C) Fused silica (D) Platinum

69. An object of approximately 0.001mg can be best measure with which of following analytical balance?
(A) Electric (B) Macro
(C) Semi-micro (D) Micro

70. Which of volumetric and gravimetric analysis is more sensitive?
(A) Volumetric analysis
(B) Gravimetric (C) Precipitation
(D) Weight measurements

71. The volume of liquid being measured in the graduated cylinder is:

(A) 8.000 cm^3 (A) 8.50 cm^3
(C) 8.00 cm^3 (D) 8.0 cm^3

72. Which of following is not a desiccant?
(A) Calcium chloride (B) Silica gel
(C) NaOH (D) CaO

73. Temperatures up to about ———°C can be reached with muffle furnaces?
(A) 300 (B) 800
(C) 1000 (D) 1200

74. Ashless filter paper is generally used for ——— work in which the paper is ignited away and leaves a precipitate suitable for weighing?
(A) Qualitative (A) Quantitative
(C) bio-lab (D) Semi-macro

75. Which of following method can be used to process sample for organic matter analysis?
(A) Wet digestion (B) Ashing
(C) Solvent extraction
(D) None of above

76. NaOH solution is a ——— standard?
(A) Primary (B) Secondary
(C) Tertiary (D) All above

77. What is most important in analytical laboratory?
(A) Cleanness
(B) Temperature control
(C) Environment (D) Safety

ANSWERS

1. B	2. D	3. A	4. C
5. C	6. A	7. B	8. C
9. D	10. B	11. B	12. D
13. B	14. C	15. D	16. D
17. C	18. D	19. A	20. A
21. A	22. C	23. C	24. A
25. D	26. A	27. D	28. A
29. D	30. A	31. D	32. B
33. D	34. B	35. D	36. D
37. D	38. B	39. B	40. B
41. B	42. D	43. D	44. D
45. D	46. A	47. A	48. A
49. A	50. A	51. D	52. D
53. D	54. D	55. D	56. C
57. C	58. B	59. D	60. D
61. A	62. B	63. A	64. C
65. C	66. D	67. B	68. D
69. D	70. A	71. B	72. D
73. D	74. B	75. C	76. B
77. D			

5.1. FUNDAMENTAL CONCEPTS

1. Which of the following statement is not related with environmental pollution?
   (A) Direct or indirect change in any component of the biosphere
   (B) Undesirable change in the physical characteristics of the air
   (C) Undesirable change in the chemical characteristics of the water
   (D) Not affecting adversely the industrial progress.

2. The science of all the relations of all the organisms to their environment is called
   (A) Biology (B) Botany
   (C) Environmental chemistry
   (D) Ecology

3. Which of the following statement is not related with industrial ecology?
   (A) Study of interactions between human activities and its environment
   (B) Industrial ecology seeks to optimize the total industrial materials cycle from virgin material to finished product
   (C) Industrial impacts on the environment
   (D) Economic systems are viewed in isolation from their surroundings

4. Which of the following is component of the ecosystem?
   (A) Inorganic substances
   (B) Organic substances
   (C) Animals and plants only
   (D) All above

5. Which of the following energy is trapped by the autotrophic organisms?
   (A) Mechanical energy
   (B) Electrical energy
   (C) Radiant energy
   (D) Vibrational energy

6. In biological ecosystem, which of the following substance is used by organisms?
   (A) Water (B) Sunlight
   (C) Minerals (D) All above

7. Which of the following process involves the use of organic compound as an electron acceptor?
   (A) Aerobic respiration
   (B) Anaerobic respiration
   (C) Fermentation (D) Glycolsis

8. Which of the following statements is not related to the decomposition phenomenon occurring in nature?
   (A) Decomposition is due to autotrophic organisms
   (B) Decomposition involves bacteria and fungi
   (C) During decomposition organisms carry out specific reactions
   (D) Many species of decomposer are present in the biosphere

9. Which of the following statement is not true with respect to the role of matter undergoing decomposition?
   (A) Decomposed matter increases soil fertility
   (B) They provide a texture which is favourable for plant growth
   (C) Decomposition products may be harmful if present in excess
   (D) In high concentration the decomposition product may increase the photosynthesis

10. Which of the following biogeochemical cycles is not component of ecosystem?
(A) Carbon cycle
(B) Potassium cycle
(C) Oxygen cycle (D) Nitrogen cycle

11. Which of the following substance is most abundant of all components of atmospheric air?
(A) O_2 (B) N_2
(C) X_c (D) CO_2

12. Which of the following process is involved in getting back nitrogen into atmosphere?
(A) Nitrification (B) Denitrification
(C) Ammonification
(D) All above

13. Which of the following process is involved in nitrogen fixation?
(A) Non-symmetric fixation of nitrogen
(B) Fixation by soil bacteria
(C) Fixation by yeast
(D) All above

14. Which of the following statement is not correct with respect to hydrolytic cycle?
(A) Water covers about 83% of the earth's surface
(B) Water covers about 73% of the earth's surface
(C) It is the major constituent of the lithosphere
(D) It is essential requirement of all the organisms

15. Which of the following is domain of industrial ecology?
(A) The materials extractor
(B) The materials processor
(C) The consumer
(D) All above

16. Which of the following is an important aspect of industrial ecology?
(A) Minimising air emissions
(B) Minimising liquid waste
(C) Designing for energy efficiency
(D) All above

ANSWERS

1. D	2. D	3. D	4. D
5. C	6. D	7. C	8. A
9. D	10. B	11. B	12. D
13. D	14. A	15. D	16. D

5.2. ENVIRONMENTAL CHEMISTRY

1. Pesticide residues appear in which of the following foods
(A) Milk (B) Fruit
(C) Fish (D) All above

2. Which of the following substances act as pollutant?
(A) Oils (B) Greases
(C) Metallic wastes
(D) All above

3. Which of the following acid acts as acid waste from coal mines?
(A) HCl (B) HNO_3
(C) H_2SO_4 (D) CH_3COOH

4. Which of the following substance acts as gaseous pollutant?
(A) NO (B) NO_2
(C) SO_2 (D) All above

5. Which of the following metal acts as pollutant?
(A) Hg (B) Pb
(C) Zn (D) All above

6. Which of the following agrochemical acts as pollutant?
(A) Fertilizers (B) Weedicides
(C) Herbicides (D) All above

7. Which of the following substance act as photochemical oxidant?
(A) Ozone
(B) Peroxyacetyl nitrate
(C) NO_x (D) All above

8. Which of the following pollutant is generated from combustion of fuel?
(A) Smoke (B) CO_2
(C) SO_2 (D) All above

9. Which of the following substance is released into environment in the nuclear power plants?
(A) Iodine – 131 (B) Cs – 137
(C) Sr – 90 (D) All above

10. Commercial incinerators produce
(A) Smoke (B) CO
(C) NO_x (D) All above

11. SO_2 is generated from which of the following industry?
(A) Drying and packing
(B) Paper (C) Pulp
(D) Paper and pulp

12. Which of the following is a non-degradable pollutant?
(A) Long chain phenolics
(B) DDT (C) Mercuric salts
(D) All above

13. Which of the following gas protects us form harmful effect of UV radiation?
(A) SO_2 (B) NO_2
(C) CO (D) O_3

14. Ozone filters out radiation below?
(A) 1000 Å (B) 2000 Å
(C) 3000 Å (D) 4000 Å

15. Chloroflororocarbons (CFC) are widely used as coolants in
(A) Air conditioners
(B) Clearing solvents
(C) Aerosol propellants
(D) All above

16. The reduction in ozone layer would lead to
(A) Temperature changes
(B) Cancer
(C) Increase uv radiation on earth
(D) All above

17. Which of the following substance is a volatile metal?
(A) Lead (B) Zinc
(C) Mercury (D) Cadmium

18. Which of the following substance is colloidal in nature?
(A) Clay (B) Fe_2O_3
(C) Al_2O_3 (D) All above

19. Which of the following pollutant is not primary pollutant?
(A) Ash (B) Smoke
(C) Fumes (D) SO_3

20. Which of the following pollutant is not secondary pollutant?
(A) SO_3 (B) NO_2
(C) SO_2
(D) Peroxyacetyl nitrate (PAN)

21. Which of the following substance is generally not considered an air pollutant?
(A) CO (B) CO_2
(C) SO_2 (D) NO_2

22. Particulate from soil and mineral primarily contains
(A) Sodium compounds
(B) Calcium compounds
(C) Aluminium compounds
(D) Calcium, aluminum and silicon compounds

23. The most harmful components of incomplete combustion are generally grouped as particulate polycyclic matter organic (PPOM). These materials are derivatives of
(A) Benzene (B) Naphthalene
(C) Anthracene (D) Benz-α-pyrene

24. Which of the following trace elements may be present in the particulate materials?
(A) Cadmium (B) Nickel
(C) Mercury (D) All of above

25. Which of the following statement is not related with SO_2?
(A) It is a colourless gas
(B) It has sharp and pungent odour
(C) It is moderately soluble in water
(D) It is reduced slowly in clear air to H_2S

26. Which of the following gas forms weakly acidic sulphurous acid (H_2SO_3)?
(A) SO_2 (B) NO_2
(C) SO_3 (D) NO

27. Which of the following oxide is formed in appreciable quantity in the atmosphere?
(A) NO (B) NO_2
(C) N_2O (D) All above

28. Which of the following statement is not relevant with nitrous oxide?
(A) It is a colorless and odourless gas
(B) It is non-toxic gas
(C) It is present in the atmosphere in higher concentration
(D) It has high reactivity in the lower atmosphere

29. Which of the following statement is not related with nitric oxide?
(A) It is a colorless and odourless gas
(B) It is produced largely by fuel combustion
(C) It is a brown pungent gas
(D) It absorbs sun light and starts photochemical reactions

30. Which of the following statement is no true with respect to nitrogen dioxide?
(A) It is produced by the oxidation of NO
(B) Its small concentration has been detected in lower stratosphere
(C) It is major pollutant
(D) It does not absorb sun light

31. Which of the following statement is related with CO?
   (A) It constitutes the single largest pollutant in urban atmosphere
   (B) It is a colorless and tasteless gas
   (C) It has less affinity towards hemoglobin
   (D) It has a boiling point of – 192°C

32. Which of the following statement is not true with respect to hydrocarbons?
   (A) They are gaseous and liquids
   (B) They can be saturated or unsaturated
   (C) They in air by themselves alone cause harmful effects
   (D) They form photochemical oxidants

33. Which of the following pollutant results from combustion of fossil fuels?
   (A) SO_2 (B) NO_x
   (C) CO (D) All above

34. Which of the following pollutant results from roasting and heating processes?
   (A) Dust (B) Smoke
   (C) Metal fumes (D) All above

35. Which of the following pollutants results from chemicals, petroleum and paper industries?
   (A) SO_x (B) Hydrocarbons
   (C) NO_x (D) All above

36. Which of the following process is used for the removal of particulates?
   (A) Wet removal by precipitation
   (B) Sedimentation
   (C) Diffusion and impaction
   (D) All above

37. Which of the following process is used for the removal of gases?
   (A) Precipitation
   (B) Chemical reaction in the atmosphere
   (C) Absorption (D) All above

38. Which of the following health effect is caused by lead?
   (A) Cancer (B) Neurotoxin
   (C) Hypertension
   (D) Kidney damage

39. Which of the following health effect is caused by mercury?
   (A) Nerve damage (B) Brain damage
   (C) Kidney damage
   (D) All above

40. Which of the following health effect is caused by cadmium?
   (A) Hypertension
   (B) Cardiovascular problem
   (C) Kidney damage
   (D) All above

41. Which of the following statements is not related with principal requisites of water for industrial purposes?
   (A) It should be hard as possible and does not contain nitrate
   (B) It should be pure and cool
   (C) It should not contain iron
   (D) It contains less quantity of line

42. Water that easily forms a lather of films and froths when agitated with a soap solution is called
   (A) Hard water (B) Heavy water
   (C) Distilled water (D) Soft water

43. Water that does not form a lather of films when agitated with a soap solution is called
   (A) Hard water (B) Soft water
   (C) Heavy water
   (D) Deionized water

44. The hardness of water is due to the presence of dissolved soluble salts of
   (A) Calcium (B) Magnesium
   (C) Iron (D) All above

45. Which of the following statement is not correct with respect to hardness of water?
   (A) It is due to soluble salts of Na
   (B) It is due to soluble salts of Ca

(C) It is due to soluble salts of Mg
(D) It is due to soluble salts of Fe

46. Temporary hardness of water is due to
(A) Bicarbonates of K
(B) Bicarbonates of Na
(C) Carbonates of Ca
(D) Bicarbonates of Cs

47. Permanent hardness of water is due to
(A) Sulphate of Ca (B) Chloride of Ca
(C) Sulphate of Mg (D) All above

48. Temporary hard water is softened on industrial scale by adding
(A) $Mg(OH)_2$ (B) $Ca(OH)_2$
(C) KOH (D) NaOH

49. Permanent hard water is softened by addition of
(A) Na_2CO_3 (B) $CaCO_3$
(C) $MgCO_3$ (D) $BaCO_3$

50. Which of the following water require zero hardness?
(A) Boiler feed water
(B) Laundry water
(C) Paper will water
(D) Dyeing water

51. Which of the following process is not physical in nature?
(A) Mixing (B) Flocculation
(C) Sedimentation
(D) Activated sludge process

52. Which of the following is not physical characteristics of water?
(A) Smell (B) Odour
(C) Colour
(D) Chlorine contents

53. Which of the following is a not chemical characteristic of water?
(A) pH (B) COD
(C) BOD (D) Colour

54. Which of the following is a not biological characteristic of water?
(A) Animals (B) COD
(C) Plants (D) Viruses

55. Which of the following compounds has fishing odour?
(A) Ammonia
(B) Organic sulphides
(C) Amines
(D) Carboxylic acids

56. Which of the following chemical strong oxidizing agent is used in COD test?
(A) $KMnO_4$ (B) H_2SO_4
(C) CH_3COOH (D) $K_2Cr_2O_7$

57. Ground water is threatened with pollution from which of the following source?
(A) Domestic wastes
(B) Industrial wastes
(C) Agricultural wastes
(D) All above

58. Which of the following statement is not correct with respect to harmful effects of ground water pollution?
(A) It causes lungs cancer
(B) It causes jaundice
(C) It causes typhoid, dysentery and diarrhea
(D) It helps to prevent epidemics

59. Which of the following statement is not related with the effect of thermal pollution?
(A) Decrease in BOD
(B) Increase in BOD
(C) Reduction in DO
(D) Excessive eutrophication

60. Which of the following statement is not correct with respect to radioactive pollutants?
(A) Carcinoma and breast cancer
(B) Leukemia
(C) Increases biological immune system
(D) Somatic and generic disorder

61. Which of the following techniques are used for minimizing water pollution?
(A) Stabilization of ecosystem
(B) Recharge of the waste
(C) Waste treatment
(D) All above

62. The expected specific waste of food industry is
(A) Meats (B) Fats or oils
(C) Bones (D) All above

63. The expected specific wastes of textile industry is
(A) Cloth residue (B) Fibre residue
(C) Dyes (D) All above

64. The expected specific waste of paper and allied products industry is
(A) Chemicals
(B) Paper and fibre residues
(C) Inks (D) All above

65. The expected specific waste of petroleum industry is
(A) Asphalt and tars
(B) Paper (C) Cloth
(D) Fibre

66. Which of the following material is a constituent of crop residue?
(A) Cull (B) Fruit
(C) Vines (D) All above

67. Which of the following disposal method is used for municipal wastes?
(A) Compaction (B) Composting
(C) Recycling (D) All above

68. Which of the following disposal method is used for agriculture wastes?
(A) Dump (B) Landfill
(C) Incineration (D) All above

69. Which of the following statement represent advantages of sanitary landfill?
(A) Economical method
(B) Low initial investment
(C) Flexible daily capacity
(D) All above

70. Which of the following statement represent disadvantages of sanitary landfill?
(A) Public opposition
(B) Uneconomical (C) Health hazard
(D) All above

71. Which of the following pollutants does not leave a residue?
(A) Air pollutant
(B) Chemical pollutant
(C) Soil pollutant
(D) Noise pollutant

72. In plant noise control, which of the following method is used for reducing noise?
(A) Plant planning
(B) Control at the source
(C) Control of the transmitted noise
(D) All above

73. The maximum noise level at which a man can work for 8 hours is
(A) 80 dB (B) 70 dB
(C) 60 dB (D) 90 dB

74. The unit of sound pressure level is
(A) Pascal (B) Decibel
(C) Newton (D) Ampere

75. The range of sound pressure for uncomfortable level is
(A) 80 – 90 dB (B) 100 – 120 dB
(C) 130 – 140 dB (D) 50 – 90

76. The range of sound pressure which is painful is as
(A) 130 – 140 dB (B) 100 – 120 dB
(C) 90 – 80 dB (D) 80 – 90 dB

77. Human hearing is sensitive to frequency in the range of about
(A) 10,000 – 20,000 Hz
(B) 10,000 – 30,000 Hz
(C) 10 – 10,000 Hz
(D) 16 — 20,000 Hz

78. A high frequency sound has frequency
(A) 100 Hz (B) 200 Hz
(C) 300 Hz (D) 500 Hz

79. Which of the following level is an indicator of hearing loss?
(A) > 25 dB (B) < 25 dB
(C) > 20 dB (D) < 20 dB

80. Which of the following is non-auditory effect of noise on human body?
(A) Changes in the vascular tone
(B) Increase in the blood pressure
(C) Wakening of the coloured vision
(D) All above

81. A man has to think of alternate sources of energy due to
(A) Shortage of vehicles
(B) Shortage of fossil fuels
(C) Construction of house
(D) Running of power plant

82. The alternate feasible fuel for existence of mankind is
(A) Uranium (B) Wood
(C) Bentonite (D) Crop residues

83. Which of the following process is a source of nuclear pollution?
(A) Uranium mining
(B) Uranium milling
(C) Uranium processing
(D) All above

84. The main active contaminants of uranium processing are
(A) U – 235 (B) U – 238
(C) Th (D) All above

85. The main active contaminants of nuclear reactors are
(A) Co – 60 (B) Mn – 54
(C) Sr – 90 (D) All above

86. The key element to be considered when evaluating a health hazard is
(A) The amount of material the employee is exposed
(B) The total time of exposure
(C) The toxicity of the substance
(D) All above

87. Acute toxicity is expressed by the term
(A) LD_{50} (B) IC_{50}
(C) $t_{1/2}$ (D) Mean life

ANSWERS

1. D	2. D	3. D	4. D
5. D	6. D	7. D	8. D
9. D	10. D	11. D	12. D
13. D	14. C	15. D	16. D
17. C	18. D	19. D	20. C
21. B	22. D	23. D	24. B
25. D	26. C	27. D	28. D
29. C	30. D	31. C	32. C
33. D	34. D	35. D	36. D
37. D	38. B	39. D	40. D
41. D	42. D	43. A	44. D
45. A	46. C	47. D	48. B
49. A	50. B	51. D	52. D
53. D	54. B	55. C	56. D
57. D	58. D	59. A	60. C
61. D	62. D	36. D	64. D
65. A	66. D	67. D	68. D
69. D	70. D	71. D	72. D
73. D	74. B	75. B	76. A
77. D	78. D	79. D	80. D
81. B	82. A	83. D	84. D
85. D	86. D	87. A	

5.3. ENVIRONMENTAL POLLUTION

1. Ozone hole refers to
(A) Black hole
(B) Decrease in thickness of ozone layer in stratosphere
(C) Decrease of thickness of ozone in troposphere
(D) Increase concentration of ozone in the atmosphere

2. Photochemical smog is related to pollution of
(A) Air (B) Water
(C) Soil (D) All of above

3. Most hazardous metal pollutant of automobile exhaust is
(A) Mercury (B) Tin
(C) Cadmium (D) Lead

4. Which of the following play significant role in depletion of ozone layer?
(A) Oxides of nitrogen
(B) Oxides of carbon
(C) Oxides of sulphur
(D) None of the above

5. Which among the following is secondary pollutant?
(A) CO (B) CO_2
(C) PAN (D) Aerosol

6. DDT is
(A) Biodegradable pollutant
(B) Nodegradable contaminant
(C) Air pollutant (D) An antibiotic

7. Peeling of ozone umbrella is due to
(A) CFC_s (B) PAN
(C) CO_2 (D) Coal burning

8. Ozone layer of stratosphere requires protection from indiscriminate use of
(A) Fungicides, insecticides, bactericides and medicines
(B) Aerosols and high flying jets
(C) Atomic explosions and industrial wastes
(D) Weather balloons

9. Environmental pollution affects
(A) Biotic components
(B) Plants only (C) Humans only
(D) Both biotic and abiotic components of environment

10. Water pollution is due to
(A) Agricultural discharges
(B) Swages and other wastes
(C) Industrial effluents
(D) All the above

11. Water is often treated with chlorine to
(A) Increase oxygen content
(B) Kill germs
(C) Cause sedimentation
(D) Remove insoluble impurities

12. The presence of which of the following in drinking water is responsible for mottling of teach
(A) Mercury (B) Iodine
(C) Chlorine (D) Flourine

13. Photochemical smog is generally formed
(A) In early hours of winters
(B) Around mid day in summer months
(C) When intensity of solar radiations is very low
(D) When concentration of particulate matter is very low

14. Which of the following reacts with haemoglobin of blood and produce toxic effect?
(A) Carbon dioxide
(B) Carbon monoxide

(C) Oxygen
(D) Carbon suboxide

15. Which of the following is major sink for carbon monoxide?
(A) Water (B) Soil
(C) Animal respiration
(D) Salts dissolved in ocean water

16. U.V. radiation from the sun causes a reaction in the atmosphere that leads to production of
(A) Fluorides (B) Carbon monoxide
(C) Sulphur dioxide (D) Ozone

17. For an average exposure of 8 hours per day, the maximum permissible concentration limit of CO in the atmosphere is
(A) 50 ppm (B) 500 ppm
(C) 10^3 ppm (D) 20 ppm

18. Which of the following pose threat to historical monument Taj Mahal?
(A) Floods in Yamuna river
(B) Temperature mediated spoilage of marble
(C) Air pollutants from Mathura refinery
(D) Weathering of marble

19. Classical smog occurs in place of
(A) Excess concentration of SO_2
(B) Low temperature
(C) High temperature
(D) Excess concentration of ammonia

20. Which is not a pollutant from the exhaust of motor?
(A) Hydrocarbons
(B) Carbon monoxide
(C) NO_x (D) Fly ash

21. Acid rain is caused due to increase in the concentration of —— in the atmosphere
(A) Ozone and dust
(B) CO_2 and CO (C) SO_3 and CO
(D) SO_2 and NO_2

22. Environmental pollution refers to
(A) Peeling of top soil
(B) Dissipation of energy
(C) Release of toxic/undesirable materials in environment
(D) None of the above

23. As it passes into food chain, the concentration of DDT
(A) Remains same (B) Decreases
(C) Increases (D) Unpredictable

24. The agricultural field that produces maximum methane gas into atmosphere is
(A) Wheat field (B) Paddy field
(C) Cotton field
(D) Groundnut field

25. Photochemical smog is caused primarily by
(A) CO (B) CO_2
(C) O_3 (D) NO_2

26. Photochemical smog consists of excessive amount of X in addition to aldehydes, ketones, PAN etc. X is
(A) Methane
(B) Carbon monoxide
(C) Carbondioxide (D) Ozone

27. Result of ozone hole is
(A) Acid rain
(B) Global warming
(C) Increased amount of CO_2
(D) Greater exposure of earth to U.V. rays

28. Which of the following is biodegradable pollutant?
(A) Domestic waste
(B) DDT
(C) Mercury salts (D) Aluminium foil

29. Chief source of water and soil pollution is
(A) Mining of ores
(B) Thermal power plant
(C) Agro-industry (D) All the above

30. Eutrophication is process which involves
    (A) Depletion of ozone layer
    (B) Increase in the concentration of ozone in water
    (C) Decrease in the concentration of dissolved oxygen in water by algae
    (D) Decrease in the level of SO_2 in air

31. Which of the following cause water pollution?
    (A) Smoke/fly ash
    (B) Automobile exhausts
    (C) Aeroplanes
    (D) Silt and pesticides

32. Air pollution is not caused by
    (A) Pollen grains
    (B) Hydroelectric power
    (C) Industries (D) Automobiles

33. Carbon monoxide is harmful to human beings as it
    (A) Is carcinogenic
    (B) Is antagonistic to CO_2
    (C) Has higher affinity for haemoglobin as compared to oxygen
    (D) Is destructive to O_3

34. Disease caused by eating fish found in water contaminated with industrial waste having mercury is
    (A) Minamata disease
    (B) Bright's disease
    (C) Hashimoto's disease
    (D) Osteosclerosis

35. Maximum desirable concentration of fluorides according to international standard is
    (A) 10 – 100 ppm (B) 1 ppm
    (C) 100 – 200 ppm (D) 10 – 20 ppm

36. Fish die in water bodies polluted by sewage due to
    (A) Pathogens
    (B) Clogging of gills by silt
    (C) Reduction in dissolved oxygen
    (D) Foul smell

37. Drained sewage has B.O.D.
    (A) More than that of water
    (B) Less than that of water
    (C) Equal to that of water
    (D) None of the above

38. Which of the following is atmospheric pollutant?
    (A) CO_2 (B) CO
    (C) O_2 (D) N_2

39. Carbon dioxide content in atmosphere is?
    (A) 0.0034% (B) 0.034%
    (C) 0.34% (D) 3.4%

40. Burning of fossil fuels is the main sources of which of the following pollutant?
    (A) Nitrogen oxide (B) Nitric oxide
    (C) Nitrous oxide
    (D) Sulphur dioxide

41. Which of the following is a mode of controlling pollution in big cities?
    (A) Cleanliness and less use of insecticides
    (B) Proper disposal of organic wastes, sewage and industrial effluents
    (C) Broader roads and shifting of factories out of the residential areas
    (D) All the above

42. Domestic waste mostly constitutes
    (A) Non-biodegradable pollution
    (B) Biodegradable pollution
    (C) Effluents (D) Air pollution

43. Ozone layer of upper atmosphere is being destroyed by
    (A) Chlorofluorocarbons
    (B) SO_2
    (C) Photochemical oxidants/O_2 and CO_2
    (D) Smog

44. Increased asthmatic attacks in certain seasons are related to
(A) Inhalation of seasonal pollens
(B) Eating of seasonal vegetables
(C) Low temperature
(D) Wet and dry environment

45. Ozone depletion in stratosphere will result in
(A) Forest fires
(B) Increased incidence of skin cancer
(C) Global warming
(D) None of the above

46. Which one of the following is a source of energy but does not cause pollution?
(A) Gasoline
(B) Nuclear power plant
(C) Fossil fuels (D) Sun

47. Which of the following substance is not present in acid rain?
(A) Sulphuric acid (B) Nitric acid
(C) Sulphurous acid
(D) Acetic acid

48. Lung diseases are about four times more in urban areas as compared to rural areas. This is due to the presence of which of the following in atmosphere?
(A) CO_2 (B) NO_2
(C) O_2 (D) N_2

49. Which of the following is not a chemical pollutant?
(A) Solid waste (B) Noise
(C) Insecticides (D) Liquid waste

50. Earth is protected from U.V. radiations by
(A) Carbon dioxide layer
(B) Oxygen layer (C) Ozone layer
(D) Troposphere

51. When rain is accompanied by a thunderstorm, the collected rain water will have pH?
(A) Slightly lower than that of rain water without thunderstorm
(B) Slightly higher than that of rain water without thunderstorm
(C) Uninfluenced by occurrence of thunderstorm
(D) Which depends on amount of dust in air

52. Ozone in stratosphere is depleted by
(A) CF_2Cl_2 (B) C_7F_{16}
(C) $C_6H_6Cl_6$ (D) C_6F_6

53. Which of the following responsible for depletion of ozone layer in upper strata of the atmosphere?
(A) Polyhalogens (B) Ferrocene
(C) Fullerenes (D) Freons

54. The smog is essentially caused by the presence of
(A) O_3 and N_2 (B) O_2 and N_2
(C) Oxides of sulphur and nitrogen
(D) O_2 and O_3

55. Detergents are known to pollute rivers and water ways. However, detergents can be made biodegradable and pollution free by taking
(A) Cyclic hydrocarbon chain
(B) Shorter hydrocarbon chain
(C) Unbranched hydrocarbon chain
(D) Hydrocarbon with more branching

56. Which of the following is not a secondary pollutant:
A. Ozone B. Carbonic acid
C. Sulphuric acid D. Carbon Dioxide

57. Major anthropogenic cause of SO_2 on global scale is:
A. Volcanoes B. Electric sparks
C. Combustion D. All above

58. DDT is a:
A. Insecticide B. Fungicide
C. Herbicide D. All above

59. Ozone in stratosphere extends up to Km:
A. 15-40 B. 10-15
C. 15-25 D. 0-15

60. Ozone acts as:
A. Oxidant B. Pollutant
C. Saver D. All above

61. Acid present in acid rain may be:
A. H_2SO_4 B. HNO_3
C. Both A & B D. None

62. The yellow colour in photochemical smog is due to presence of:
A. Dinitrogen oxide
B. Nitrogen dioxide
C. Chlorine gas
D. Chlorine dioxide

63. In which of the following layer of atmosphere there is more thickness of ozone layer?
A. Troposphere B. Stratosphere
C. Mesosphere D. Photosphere

64. Which of the following air pollutants is more dangerous for ozone layer?
A. CFCs B. CO_2
C. CO
D. Oxides of nitrogen

65. Which of the following gas is the main cause of acid rain?
A. SOx B. NO_x
C. both A & B D. None of these

66. Which of the following factors help to measure quality of water?
A. DO B. BOD
C. COD D. All of the above

67. In the purification of portable water the coagulant used is:
A. Alum B. Nickel sulphate
C. Copper sulphate
D. Barium sulphate

68. Which one of the following makes the bulk of hydrosphere's content?
A. Oceans
B. Glaciers & icecaps
C. Fresh water lakes
D. All have equal

69. The percentage of suspended solid waste in raw water is removed by coagulation is:
A. 60 B. 70 C. 80 D. 90

70. The minimum value of DO required for water to be pure is:
A. 1 ppm B. 2 ppm
C. 3 ppm D. 4 ppm

71. Which value of COD will indicate more polluted water?
A. Low value B. Higher value
C. Both values D. None of them

72. Ozone in most of the tropical regions acts as a pollutant and causes:
A. Damages to eyes B. Asthma
C. Chest discomfort D. All of these

73. The toxic organic compounds and heavy metals and metalloids result in contamination of:
A. Surface water B. Ground water
C. Both A & B D. None of these

74. Pollutant of automobile exhausts that effects nervous system/ produces mental disease is:
A. Mercury B. Lead
C. Sulfur oxide D. Nitrogen oxide

75. Increased asthmatic attacks in certain seasons are related to:
A. inhalation of seasonal pollen
B. Eating of seasonal vegetables
C. Low temperature
D. Wet and dry environment

76. Pollution is:
A. Removal of top oil
B. Release of toxic/undesirable materials in environment
C. Conservation of energy
D. All of the above

77. UV radiations bring about:
A. Skin cancer B. Lung cancer
C. Mouth cancer D. Liver cancer

78. Biodegradable pollutant is:
A. Plastic B. Asbestos
C. Sewage D. Mercury

79. Carbon monoxide, emitted by automobile prevents transport of oxygen in body due to:
A. Combining with oxygen to form carbon dioxide
B. Destruction hemoglobin
C. Preventing reaction between oxygen and hemoglobin
D. Forming stable compound with hemoglobin

80. Water is often treated with chlorine to:,
A. Increase oxygen content
B. Kill germs
C. Remove hardness
D. Remove suspended particles

81. Photochemical smog is related to pollution of:
A. Air B. Water
C. Soil D. All of the above

82. Which of the following reacts with hemoglobin of blood and produce toxic effect.
A. Carbon dioxide
B. Carbon monoxide
C. Oxygen
D. Carbon suboxide

83. Burning of fossil fuels is the main source of which of the following pollutant?
A. Nitrogen oxide B. Nitric oxide
C. Nitrous oxide D. Sulphur dioxide

84. Which of the following pose severe threat to historical monument buildings?
A. Floods
B. Temperature mediated spoilage of marble
C. Air pollutants from chemical industries
D. Weathering of marble

85. Environmental pollution affects:
A. Biotic components B. Plants only
C. Humans only
D. Both biotic and abiotic components of environment

86. Carbon dioxide content in atmosphere is:
A. 0.0034% B. 0.034 %
C. 0.34 % D. 3.4 %

87. BOD refers to:
A. Biological oxygen deficit
B. Total oxygen demand of biosphere
C. Biological oxygen demand of polluted water
D. None of the above

88. Ozone hole is maximum spread over:
A. Europe B. America
C. Antarctica D. Australia

89. Atmosphere of metropolitan cities is mostly polluted by:
A. Automobile exhausts
B. Pesticide residue
C. Household waste
D. Radio-active fall out

90. Ozone depletion in stratosphere will result in:
A. Forest fires
B. Increased incidence of skin cancer
C. Global warming
D. None of the above.

91. Phosphate pollution is caused by:
A. Weathering of phosphate rocks only
B. Carbon dioxide dissolved in water
C. Phosphate rocks and sewage
D. Sewage and agricultural fertilizers

92. The region of atmosphere that extends from 50 km 85 km in altitude is called:
A. Troposphere B. Mesosphere
C. Stratosphere D. Biosphere

93. Which one of the following is a source of energy but does not cause pollution?
A. Gasoline
B. Nuclear power plant C. Sun
D. Fossil fuel

94. Green chemistry refers to:
A. Chemistry of plants
B. Chemistry of green pigments
C. Development of chemical products and processes less harmful to humans
D. Chemistry of greenhouse effect

95. Which of the following substance is not present in acid rain?
A. Sulphuric acid B. Nitric acid
C. Sulphurous acid D. Acetic acid

96. Which of the following is not a chemical pollutant?
A. Solid waste B. Noise
C. liquid waste D. Insecticides

97. Earth is protected from U.V. radiations by:
A. Carbon dioxide layer
B. Oxygen layer C. Ozone layer
D. Troposphere

98. Water pollution is mainly due to which of the following?
A. Sulphur dioxide B. Carbon dioxide
C. Oxygen
D. Industrial effluents

99. COD refers to:
A. Chemical oxygen demand
B. Chemistry of diamonds
C. Catalyzed oxidation of diamond
D. Catalyzed oxidation of dissolved salts.

100. Spraying of DDT produces pollution of:
A. Air B. Air and water
C. Air and soil
D. Air, water and soil

101. Fluorosis, the bone disease, is caused by the presence of:
A. Pesticides in water
B. fluorides in water
C. carbon monoxide in air
D. sulphur dioxide in air

102. Which environmental problem could lead to a rise in sea level?
A. Acid rain
B. Cutting down the trees in the rain forests
C. Damage to the ozone layer
D. Global warming

103. Which of the following gas is not a green house gas?
A. CO B. O_3
C. CH_4 D. H_2O vapour

104. Which of following is not a type of pollutant for water bodies?
A. Heavy metals
B. Organo metallic compounds
C. Heat D. None

105. Air is made of?
A. Liquid B. Solid
C. Gases D. All

106. EPA stands for?
A. Element protection agreement
B. Environmental protection agreement
C. Environmental protection agency
D. All

107. ISO stands for?
A. International Standard Organization
B. International Organization for Standardization,
C. International Science organization
D. All

ANSWERS

1. B	2. A	3. D	4. A
5. C	6. B	7. A	8. B
9. D	10. D	11. B	12. D
13. B	14. B	15. B	16. D
17. A	18. C	19. B	20. D
21. D	22. C	23. C	24. B
25. D	26. D	27. D	28. A
29. D	30. C	31. D	32. B
33. C	34. A	35. B	36. C
37. A	38. B	39. B	40. D
41. D	42. B	43. A	44. A
45. B	46. B	47. D	48. B
49. B	50. C	51. A	52. A
53. D	54. C	55. C	56. D
57. C	58. A	59. A	60. A
61. C	62. B	63. B	64. D
65. C	66. D	67. A	68. A
69. C	70. D	71. B	72. D
73. C	74. B	75. A	76. B
77. A	78. C	79. C	80. B
81. A	82. B	83. D	84. C
85. D	86. B	87. C	88. C
89. A	90. B	91. D	92. B
93. C	94. C	95. D	96. B
97. C	98. D	99. A	100. D
101. B	102. D	103. A	104. D
105. D	106. C	107. B	

6.1. SOAP AND DETERGENTS

1. Which of the following is a component of soap?
   A. Sodium sulphate
   B. Sodium stearate
   C. Sodium chloride
   D. Sodium nitrate.

2. During the preparation of soap the liquid separated by distillation is
   A. Sodium hydroxide
   B. Oil
   C. Stearic acid
   D. Glycerol

3. The by-product of the process of saponification is
   A. Methanol
   B. Glycol
   C. Glycerol
   D. Sodium hydroxide.

4. In the process of preparation of detergents, the organic acids produced are neutralized with
   A. Sodium hydroxide
   B. Sodium sulphate
   C. Sodium chloride
   D. Sodium nitrate.

5. Polyethylene glycols are used in the preparation of which type of detergents
   A. Cationic detergents
   B. Anionic detergents
   C. Non-ionic detergents
   D. Soaps

6. Which of the following are anionic detergents?
   A. Sodium salts of sulfonated long chain alcohol.
   B. Ester of stearic acid and polyethylene glycol.
   C. Quaternary ammonium salt of amine with acetate ion.
   D. Sodium salts of sulfonated long chain hydrocarbons.

7. Soap and detergents remove the dirt from clothes due to
   A. Osmosis
   B. Gravity
   C. Lowering of interfacial tension
   D. Capillary action

8. The green color of water in a lake is due to
   A. Excessive growth of sea weeds
   B. Algae
   C. Pollution
   D. Grass

9. When a drop of detergent solution is added onto a clean towel, it spreads instead of existing as a droplet. Which of the following statements explains this phenomenon?
   A. Detergent acts as an emulsifying agent.
   B. Detergent reduces the viscosity of water.
   C. Detergent reduces surface tension of water.
   D. Detergent reduces the density of water.

10. Soap is soluble in grease because it
    A is non-polar.
    B has a hydrophobic 'head'.
    C has a hydrophobic 'tail'.
    D has an ionic 'head' and a hydrocarbon 'tail'.

11. Which of the following does NOT react with sodium hydroxide solution?
    A. Fat
    B. Vinegar
    C. Carbon dioxide
    D. Benzene

12. Which type of organic compound does fat belong to?
    A. Alkene
    B. Ester
    C. Alkanol
    D. Alkanoic acid

13. The alkaline hydrolysis of fat is known as
A. Condensation. B. Esterification.
C. Saponification. D. Emulsification.

14. In the process of production of soap, the soap can be salted out by adding
A. Concentrated sulphuric acid.
B. Concentrated potassium hydroxide solution.
C. Concentrated sodium chloride solution.
D. Concentrated magnesium sulphate solution.

15. What is the use of the addition of brine solution in the production of soap from castor oil and sodium hydroxide?
A. To speed up the reaction
B. To lower the solubility of soap
C. To remove unreacted castor oil and sodium hydroxide
D. To increase the purity of the soap obtained

16. Soapy detergents and soapless detergents behave differently in hard water because they
A. have different hydrophilic heads.
B. have different hydrophobic hydrocarbon chains.
C. have different pH values.
D. are made by different chemical methods.

17. Each fat or oil is made up of
A A distinctive mixture of several different triglycerides.
B A distinctive mixture of several aldehydes.
C Mixture of above both.
D none of above.

18. What is caustic potash?
A NaOH B KOH
C NaCl D $NaBH_4$
E. KCl

19. The soap and detergents are source of organic pollutants like:
A Glycerol
B Polyphosphates
C Sulphonated hydrocarbons
D All above

20. ——— is best in its cleaning action.
A Soap B Detergents
C Surfactant D None of these

21. Hydrolytic reaction of fat with caustic soda is known as ———.
A Esterification B Saponification
C Acetylation D Carboxylation

22. Turpentine is obtained from ———.
A Oak tree B Pine tree
C Birch tree D Lemon tree

23. ——— surfactants perform well over a wide range of water hardness and pH.
A Anionic B Cationic
C Nonionic D none of these

24. Fats and oils are ———.
A Acids B Alcohols
C Salts D none of these

25. Washing soap can be prepared by sponification with alkali of ——— of the following oil.
A Rose oil B Paraffin oil
C Groundnut oil D Kerosene oil

ANSWERS

1. B	2. A	3. C	4. A
5. C	6. A	7. C	8. B
9. C	10. C	11. D	12. B
13. C	14. B	15. C	16. A
17. A	18. B	19. D	20. B
21. B	22. B	23. C	24. A
25. C			

6.2. CEMENT AND GLASS INDUSTRY

1. Cement is a mixture of
   A. Clay and clinker
   B. Clay limestone and gypsum
   C. Limestone and gypsum
   D. Limestone and clay

2. What is clinker?
   A. Roasted calcareous material
   B. Roasted argillaceous material
   C. Roasted calcareous and argillaceous material
   D. Roasted gypsum

3. The composition of mixture of clay and lime stone in the raw for cement material is
   A. 75% lime stone and 25% clay
   B. 25% lime stone and 75% clay
   C. 15% lime stone and 55% clay
   D. 55% lime stone and 15% clay
   E. 30% lime stone and 70% clay

4. Cement containing higher percentage of gypsum than required,
   A. Sets slowly
   B. Sets rapidly
   C. Does not set at all
   D. Gets higher strength.

5. The correct chemical equation representing the production of glass is
   A. $Na_2CO_3 + SiO_2 \rightarrow Na_2SiO_3 + CO_2$
   B. $Na_2CO_3 + SiO_2 \rightarrow Na_2SiO_3 + 2CO_2$
   C. $Na_2CO_3 + 2SiO_2 \rightarrow Na_2SiO_3 + CO_2$
   D. $Na_2CO_3 + SiO_2 \rightarrow 2Na_2SiO_3 + CO_2$

6. Glass industry requires soda ash with
   A. Solids density 1.91 and bulk density 1.0
   B. Solids density 1.86 and bulk density 0.6
   C. Solids density 1.80 and bulk density 0.58
   D. None of the above

7. Which of the following glass transmits the maximum light?
   A. Serrated glass
   B. Opalescent glass
   C. Clear glass
   D. Milk glass.

8. The main constituent of glass is:
   A. Silica
   B. Silicon
   C. Caustic
   D. Alumina

9. Rotary spinning process is used to produce:
   A. Glass wool
   B. Optical fibre
   C. Glass marble
   D. All of above

10. The different types of glass are:
   A. A–Glass, C-Glass, E-Glass and S-Glass
   B. A–Glass, B-Glass, E-Glass and S-Glass
   C. AR–Glass, C-Glass, E-Glass and S-Glass
   D. AR–Glass, B-Glass, E-Glass and S-Glass

11. Which of the following is NOT true? Ceramic materials are:
   A. Hard, have high densities (compared to metals), high compressive strength and very good thermal resistance and strength at higher temperature. Silicon
   B. Soft, have high densities (compared to metals), high compressive strength and very good thermal resistance and strength at higher temperature.
   C. Hard, have low densities (compared to metals), low

compressive strength and very good thermal resistance and strength at higher temperature.

D. Hard, have low densities (compared to metals), high compressive strength and very good thermal resistance and strength at higher temperature.

12. For quality control of Portland cement, the test essentially done is
A. All
B. Setting time
C. Soundness
D. Tensile strength

13. Which of the following raw material is not present in the cement?
A. Lime stone
B. Gypsum'
C. Red lead
D. Blast furnace slag

14. While compacting the concrete by a mechanical vibrator, the slump should not exceed
A. 2.5 cm
B. 10 cm
C. 7.5 cm
D. 5.0 cm

15. To obtain cement dry powder, lime stones and shales or their slurry, is burnt in a rotary kiln at a temperature between
A. 1400° and 1500°C
B. 1100° and 1200°C
C. 1200° and 1300°C
D. 1300° and 1400°C

16. Proper proportioning of concrete, ensures
A. Resistance to water
B. All
C. Desired durability
D. Water tightness of the structure

17. In glass or vitreous state solid the atoms are arranged in ———.
A. Regular fashion
B. Random fashion
C. Linear fashion
D. None of these

18. Glass was first made by about ———.
A. 40 BC
B. 400 BC
C. 4000 BC
D. none of these

19. The number of glass products now manufactured is ———.
A. 25,000
B. 50,000
C. 75,000
D. none of these

20. The substance that can form the glassy, non-crystalline structure is called ———.
A. Formers
B. Fluxes or modifiers
C. Stabilizers
D. None of these

21. The principle former of almost all glasses is ———.
A. $(SiO_2)_n$
B. $(SiO_3)_n$
C. (SiO_2)
D. none of these

22. Chemical compounds, which are added to reduce the reactivity of glass, are called ———.
A. Formers
B. Modifiers
C. Stabilizers
D. None of these

23. ——— is used as stabilizer.
A. CaO
B. SiO_2
C. Na_2O
D. NaCl

24. In glass making the whole combination of ingredients is called a ———.
A. Gangue
B. Batch
C. Mixture
D. none of these

25. The melting of nearly all glass is done in a continuous tank furnace, which operates steadily over periods of up to ———.
A. a day
B. a month
C. a year
D. a week

26. ——— is a heat-treatment cycle that prevents glass from harmful stress.
A. Forming
B. Annealing
C. Batching
D. none of these

27. ———— is used for Annealing.
 A. Klin B. Batch
 C. Converter D. Oven

28. The main constituents of ———— are boron oxide and silica.
 A. Pyrex glass
 B. Soda-lime glass
 C. Low silica glass
 D. Fibrous glass

29. In Pakistan how many units are involved in the production of glass ————.
 A. 20 B. 25
 C. >25 D. 30

30. In Pakistan the total production of glass is over ———— tons per year.
 A. 800 B. 8000
 C. 80,000 D. 100.000

31. The word 'ceramic' is meant for ————.
 A. Soft material B. Hard material
 C. Burnt material D. Dry material

32. Which of the following is not a characteristic property of ceramic material?
 A. High temperature stability
 B. High mechanical strength
 C. Low elongation
 D. Low hardness

33. Major ingredients of traditional ceramics
 A. silica B. clay
 C. feldspar D. All above

34. Which of the following is not a major contributor of engineering ceramics?
 A. SiC B. SiO_2
 C. Si_3N_4 D. Al_2O_3

35. Which of the following ceramic product is mostly used as pigment in paints?
 A. TiO_2 B. SiO_2
 C. UO_2 D. ZrO_2

36. Most commercial glasses consist of
 A. Lime B. Soda
 C. Silica D. All above

ANSWERS

1. B	2. C	3. A	4. A
5. A	6. A	7. C	8. A
9. A	10. C	11. D	12. A
13. C	14. D	15. A	16. B
17. B	18. A	19. C	20. A
21. C	22. C	23. A	24. B
25. A	26. B	27. A	28. A
29. B	30. C	31. C	32. B
33. D	34. B	35. A	36. D

6.3. PETROCHEMICALS AND SUGAR INDUSTRY

1. Naphthalene balls are obtained from
   A. Carbon B. Coke
   C. Coal tar D. Coal gas

2. Petroleum is formed from
   A. Domestic animals
   B. Organisms in sea
   C. Wild animals D. Insects

3. Petroleum is mixture of
   A. Petrol B. Diesel
   C. Petroleum gas D. All of these

4. The layer containing petroleum oil & gas is
   A. Above that of water
   B. Below water
   C. Between water and sand
   D. Below sand

5. Refining is
   A. Extracting petroleum gas
   B. Separation of various fractions
   C. Heating of coal
   D. Sedimentation of fossil fuel

6. LPG is used in / as
   A. Home B. Vehicles
   C. Aviation Fuel D. Road surfacing

7. Natural gas can be transported through
   A. Cylinders B. Barriers
   C. Pipes D. None of these

8. CNG is stored under
   A. Power generation
   B. Electric Generators
   C. Solvent D. None of these

9. PCRA stands for
   A. Pollution control research association
   B. Petroleum conversation Research association
   C. Petroleum control research association
   D. Petrol, coal reserve association

10. Bitumen is used in
    A. Electric generators
    B. Road surfacing
    C. Coal tar D. Natural Gas

11. What is called black gold?
    A. Petroleum B. Coal
    C. Coal Tar D. Natural gas

12. Petrol can be saved by
    A. Driving at a constant & moderate speed
    B. Ensuring correct type pressure
    C. Switching off the engine at traffic lights
    D. All of these

13. For highly paraffinc crude oil, the characterization factor will be in range of
    A. 11.5-12.5 B. 12.5-13.0
    C. 13.5-14.0 D. 14.5 -15.0

14. Which of the following statement is not true in case of catalytic reforming?
    A. High temperature results in loss of reformate yield
    B. Highly naphthenic stock require high space velocity
    C. High paraffinic stock requires low space velocity
    D. Presence of water decrease the hydrocracking activity

15. Which of the following process is not sorbent separation technology?
    A. Penex B. Parex
    C. Molex D. Olex

16. Which of the following statement is not true in case of catalytic reforming?
A. Dehydrogenation is highly endothermic
B. Dehydrogenation is exothermic
C. Dehydrocyclisation reaction is exothermic
D. Hydrodealkylation reactions are endothermic

17. Smoke Volatility index is expressed as?
A. Smoke point = 0.42 × (percentage distilled at 204°C)
B. Smoke point = 1.42 × (percentage distilled at 204°C)
C. Smoke point = 2.42 × (percentage distilled at 204°C)
D. Smoke point = 3 42 × (percentage distilled at 204°C)

18. If diesel has cetane number of 50 then the diesel index will be?
A. 36 B. 46
C. 56 D. 66

19. Which of the following is not adsorptive separation process?
A. Parex B. Olex
C. Molex D. Penex

20. Bromine number is measure of?
A. Paraffins B. Unsaturates
C. Saturates D. Aromatics

21. Aviation fuel contains
A. Light naphtha
B. Medium naphtha
C. Kerosene D. Diesel

22. Pyrolysis gasoline is obtained from
A. Catalytic cracking
B. Gasification
C. Steam cracking
D. Thermal cracking

23. Which type of the coal is preferred for metallurgical coal?
A. Lignite
B. Bituminous coal
C. Peat
D. Anthracite coal

24. What is the raw material of sugar industry?
A. Sugar cane B. Potato
C. Sugar beat D. All above

25. The first step of formation of sugar is ______
A. Extraction B. Washing
C. Cutting D. Clarifying

26 The juice is allowed to boil at lower temperatures to protect the sugar from ______
A. Hardening
B. Solubility in water
C. Caramelization
D. Dewatering

27. It is mixed with warm affination syrup (a solution of water and sugar) to loosen the molasses surrounding the raw sugar crystals is called
A. Magma B. Raw sugar
C. Refined Sugar D. Clarified suga

28. ______ remove the remaining color, producing a water-white sugar syrup
A. Carbon filters B. Centrifuge
C. Annealing D. Refining
E. None of above

29. The liquor is screened to exclude ______ material.
A. Fibrous B. Polymers
C. Residual D. None of these

30. Granulated sugar containing ______
A. Glucose B. Fructose
C. Maltose D. Sucrose

31. Granulated sugar contains ______ % Sucrose
A. 80 B. 60
C. 75 D. 99.93

32. Granulated sugar also known as
A. Brown sugar B. Caster Sugar
C. Refined Sugar D. White Sugar

ANSWERS

1. C	2. B	3. D	4. A
5. B	6. A	7. C	8. B
9. B	10. B	11. A	12. D
13. B	14. D	15. A	16. A
17. A	18. C	19. D	20. B
21. C	22. C	23. D	24. E
25. B	26. C	27. A	28. A
29. A	30. D	31. D	32. D

6.4. FERTILIZER AND PAPER INDUSTRY

1. The fertilizers which provide single nutrient from NPK are called ________ fertilizer.
   A. Straight B. Compound
   C. Both a and b D. None of above
2. Which of the following is the most suitable catalyst for ammonia synthesis?
   A. Pt B. $ZnO + Cr_2O_3$
   C. Fe in fused mixture of $Al_2O_3 + SiO_2 + MgO$
   D. All of the above
3. The cooling of molten urea by air in the tower is called
   A. Prilling B. Evaporation
   C. Condensation D. Crystallization
4. Which of the following potassium fertilizers are more useful for horticultural crops tobacco & potatoes?
   A. KCl B. KNO_3
   C. K_2SO_4 D. $KMnO_4$
5. Argillaceous material does not include
   A. Clay B. Marine shells
   C. Slate
   D. Blast furnace slag
6. The nutrients which are required in very small amount for the normal growth of plants are called
   A. Nitrogenous fertilizers
   B. Micronutrients
   C. Phosphorus fertilizer
   D. All of the above
7. Which one of the following set of raw material is most suitable for manufacture of urea?
   A. CH_4, N_2 and CO_2
   B. H_2, N_2 and CO
   C. H_2 CO_2 and H_2O
   D. H_2O N_2 and H_2
8. The percentage of nitrogen in urea is
   A. 36 % B. 46 %
   C. 56 % D. 66 %
9. The nitrogen present in some fertilizers helps plants.
   A. to fight against diseases
   B. to produce fat
   C. to undergo photosynthesis
   D. to produce protein
10. Organic farming is the technique of raising crops through uses of
    A. Manures B. Biofertilizers
    C. Resistant varieties
    D. All of these
11. Which one is green manure/ biofertilizer
    A. Sesbania B. Rice
    C. Oat D. Maize
12. Most effective pesticide is
    A. Carbamates
    B. Organophosphates
    C. Organochlorines
    D. All of these
13. Which is true for DDT? It is
    A. not a pollutant
    B. an antibiotic
    C. an antiseptic agent
    D. a non degradable pollutant
14. Which is major component of Bordeaux Mixture?
    A. Copper sulfate
    B. Sodium chloride
    C. Calcium chloride
    D. Magnesium sulphate

15. The substances added to the soil to provide one or more nutrient elements essential for plants growth are called ———.
A. Growth hormones
B. Minerals
C. Fertilizers
D. Salts

16. The substances added to the soil in very small amounts (about 6 grams to 200 grams per acre) are called ———.
A. Macronutrients
B. Micronutrients
C. Fertilizers
D. None of these

17. Fertilizers are classified in to ———.
A. Two major categories
B. Three major categories
C. Four major categories
D. None of these

18. Natural fertilizers are materials derived from ———.
A. Plants
B. Animals
C. Algae
D. All of these

19. The percentage of nitrogen in ammonia is ———%.
A. 32
B. 55
C. 82
D. 25

20. The percentage of nitrogen in ammonium Nitrate is ———%.
A. 32-35
B. 50-55
C. 80-82
D. 20-25

21. The percentage of nitrogen in ammonium sulphate is ———%.
A. 27
B. 21
C. 23
D. 19

22. The percentage of nitrogen in Urea is ———%.
A. 37
B. 50
C. 46
D. 82

23. Ammonia when used directly as a fertilizer is to be injected about ——— under the surface to keep it from seeping out.
A. 2 inches
B. 4 inches
C. 6 inches
D. 8 inches

24. Ammonium nitrate is sold as a mixture with ———.
A. Soda Ash
B. Limestone
C. Zinc
D. None of these

25. Potassium sulphate with 48% to 52% potash, is made from ———.
A. Potassium Phosphate
B. Potassium Chloride
C. Potassium Nitrate
D. None of these

26. ——— is preferred for horticultural crops and for tobacco and potatoes.
A. Potassium chloride
B. Potassium sulphate
C. Potassium Nitrate
D. None of these
E. Both A and B

27. ——— is used for fruits, vegetables and tobacco.
A. Potassium chloride
B. Potassium sulphate
C. Potassium Nitrate
D. None of these

28. The brown colour of the pulp obtained from chemical pulping is due to the presence of
A. Chlorine
B. Residual lignin
C. Sodium hybochlorite
D. All above

29. Which treatment is done with pulp before delivering it to paper making machine?
A. Pulp is dispersed in water to make slurry
B. Mechanical refining or beating of the fibers.
C. Addition of chemical additives and recycled fibres from the waste paper plant.
D. All above

30. Which substance is used as filler or additive in paper making?
   A. Starch
   B. Cellulose
   C. Glucose
   D. Fructose

31. Which substance is not used as an additive in paper industry?
   A. Glucose
   B. Starch
   C. Alum
   D. TiO_2

32. In which paper, some additive is not added?
   A. Carbon paper
   B. Filter paper
   C. Glazed paper
   D. Art paper

33. Which sequence of steps is correct in paper making machine?
   A. Pressing, Drying, Flow spreader, Calender stock
   B. Flow spreader, Pressing, Prying, Calender sock
   C. Drying, Pressing, Flow spreader, Calender stock
   D. Calender stock, Flow spreader, Prying, Pressing.

34. Calander stock is a process in paper making in which?
   A. Thickness of the paper is reduced
   B. Surface of paper is made smooth
   C. Moisture is removed
   D. Both A and B

35. What is the function of Head Box in paper making machine?
   A. It dry the paper
   B. It reduces thickness of paper
   C. It discharge the pulp at the creen of Fourdriner table
   D. It makes the surface of paper smooth.

36. What is the colour of pulp obtained from chemical pulping?
   A. Black
   B. Brown
   C. Blue
   D. Red

37. Final paper wound in the form of a reel having final moisture of about
   A. 6 – 8%
   B. 9 – 12%
   C. 13 – 15%
   D. 15 – 18%

38. Write liquor in Kraft pulping contains?
   A. NaOH
   B. NaOH and Na_2S
   C. NaOH + Na_2CO_3 + Na_2S
   D. NaOH + $NaCO_3$

39. Which of the following term is not used in pulping?
   A. Kappa number
   B. Copper number
   C. Bromine Number
   D. Permanganate number

40. Which of the following give higher fibre strength?
   A. Eucalyptus
   B. Pine
   C. Bagasse
   D. Wheat straw

41. Purpose of sizing is?
   A. To increase the strength
   B. To improve formation
   C. To increase resistance toward water
   D. To improve the bursting strength

42. Which of following is used as make up chemical in Kraft process?
   A. Na_2CO_3
   B. Na_2SO_3
   C. Na_2SO_4
   D. NaOH

ANSWERS

1. A	2. C	3. A	4. B
5. B	6. B	7. A	8. B
9. D	10. D	11. A	12. B
13. D	14. A	15. C	16. B
17. B	18. D	19. C	20. A
21. B	22. C	23. B	24. C
25. A	26. C	27. A	28. B
29. D	30. A	31. A	32. B
33. B	34. D	35. C	36. B
37. A	38. C	39. C	40. B
41. C	42. C		

6.5. METALLURGY

Which of the following is the second anciently known metal?

A. Nickel B. Copper
C. Gold D. Silver

Copper occurs in nature as

A. Native B. Combined
C. Both native and combined
D. None of the above

The principle ores of copper are

A. Copper sulphides
B. Copper oxides
C. Both sulphides and oxides
D. Copper carbonate

The formula of copper pyrite is

A. $CuFeS$ B. $CuFeS_2$
C. Cu_2FeS D. $Cu\ Fe_2S$

5. Copper is mainly extracted from which of the following ore

A. Sulphide ores B. Carbonate ores
C. Oxides ores
D. Non-sulphide ores

6 Which of the following steps are involved in the extraction of copper?

A. Roasting B. Smelting
C. Bessemerization
D. All above

7. Hydrometallurgy of copper involves extraction of copper from poor ores by which process?

A. Dry process B. Wet process
C. Both dry & wet processes
D. None of these

8. Which of the following statement is not true with respect to copper?

A. It is malleable and ductile
B. It is a best conductor of heat and electricity.
C. It forms alloys easily
D. Molten copper absorbs carbon dioxide

9. Which of the following statement is correct regarding copper?

A. It is used in electroplating
B. Its salts are used as insecticides
C. Its salts are used as coloring materials
D. All are correct

10. Which of the following is an alloy of copper?

A. Brass B. Bronze
C. Monel metal D. All

11. In German silver copper is alloyed with which metal?

A. Zn B. Ni
C. Al D. Zn & Ni

12. In monel metal copper is alloyed with which metal?

A. Fe B. Ni
C. Mn D. All

13. Copper is resistant to

A. Air B. Water
C. Acid D. All of above

14. Which of the following is the third most abundant element in the nature?

A. Oxygen B. Sulphur
C. Aluminum D. Hydrogen

15. Aluminum occurs in nature as

A. Native B. Combined form
C. Both native & combined
D. Free

16. Which is not an ore of aluminium?

A. Bauxite B. Cryolite
C. Corundum D. Monazite

17. Aluminium is usually extracted from
A. Bauxite B. Corundum
C. Feldspar D. Alumite

18. Which of the following impurities are present with the bauxite?
A. Silica B. Ferric oxide
C. Alumina
D. Both silica and ferric oxide

19. Which of the following steps is involved in the metallurgy of aluminium?
A. Purification of bauxite
B. Electrolytic reduction of alumina
C. Refining of aluminum
D. All above

20. Which of the following process is not involved in the purification of bauxite?
A. Bayer's process
B. Serpek's process
C. Hall's process
D. Goldsmith's process

21. In Serpekr's process the ore is treated with which of the following
A. Carbon B. Nitrogen gas
C. Both A & B D. None of these

22. The formula of Cryolite is
A Na_3AlF_3 B. Na_3AlF_5
C. Na_3AlF_4 D. Na_3AlF_6

23. Which of the following property is not related to aluminum?
A. It is a silvery white metal with brilliant lusture
B. It is a very light metal with specific gravity as 2.7
C. It is malleable and ductile
D. It is the least reactive element of III group

24. Which of the following is not alloy of aluminium?
A. Aluminium bronze
B. Magnalum C. Duralumin
D. Stellite

25. Which is the second most abundant element occurring in the earth crust?
A. Iron B. Cu
C. Cr D. Ni

26. Which of the following is not an ore of iron?
A. Haematite B. Magnetite
C. Siderite D. Monazite

27. How many varieties of commercial iron are known?
A. 1 B. 2
C. 3 D. 4

28. Which is the purest form of iron?
A. Pig iron B. Cast iron
C. Wrought iron D. Steel

29. How pig iron is usually obtained from?
A. Iron pyrite B. Limonite
C. Hematite D. Siderite

30. Iron which contains up to 1% carbon is called
A. Steel B. Cast iron
C. Wrought iron D. Pig iron

31. Which of the following statement is not true regarding Open Hearth process?
A. No iron is lost
B. The process is economical and simple
C. Steel obtained is of high quality
D. Scrap iron cannot be used in this process.

32. Stainless steel consists of which elements
A. Fe only B. Cr only
C. Fe & Ni D. Fe, Ni & Cr

33. In nature nickel is found in the form of
A. Sulphides B. Silicates
C. Arsenides D. All

4. Which of the following is not an ore of nickel?

A. Pentlandite B. Garnierite
C. Siderite D. Nicollite

5. What % of nickel is present in the major ore Pentlandite?

A. 22% B. 18%
C. 14% D. 10%

6. In smelting process the ore is mixed with

A. Silica B. Coke
C. Limestone D. All

7. Monel metal is a alloy of Ni which contains Ni up to

A. 50% B. 60%
C. 70% D. 80%

8. Which of the following process is used for the conversion of matte in to nickel?

A. Orford process
B. Mond,s process
C. Electrolytic process
D. All

9. Which of the following metals form volatile carbonyl with CO below 80°C?

A. Cu B. Fe
C. Co D. Ni

0. Which of the following is not a property of Ni?

A. It is a soft silvery white metal
B. It is malleable and ductile
C. It is highly magnetic
D. It has high electrical and thermal conductivities

1. Which of the following is not a proper use of Ni?

A. It is used as catalyst
B. It is used in alloy formation
C. It is used in the preparation of Monel metal
D. It is attacked by alkalis

42. The process of heating to redness and then slow cooling is known as

A. Tempering B. Quenching
C. Annealing D. Hardening

43. Chromium is found in nature in the form of

A. Oxides B. Silicates
C. Borates D. Sulphides

44. Which of the following is not an ore of Cr?

A. Chrome iron B. Nicollite
C. Crocoisite D. Chrome ochre

45. Ferrochrome contains Cr up to

A. 60–70% B. 70–80%
C. 80–90% D 40–50%

46. Which of the following is not a property of Cr

A. It is a brilliant silvery metal
B. It is malleable
C. It can take very high polish
D. Its surface is tarnished easily

47. The process of extracting a metal in pure form from its ores is known as

A. Crushing B. Grinding
C. Dressing D. Metallurgy

48. Which of the following methods is used for the concentration of ores?

A. Gravity separation
B. Magnetic concentration
C. Froth-floatation
D. All above

49. The matrix is usually in the form of

A. Sand B. Limestone
C. Rocks D. All Above

50. The process in which ore is heated, generally in the absence of air, to expel water from a hydrated oxide at temperature below their melting points is called

A. Calcination B. Roasting
C. Froth-floatation
D. Bessemerization

51. The process in which ore is heated, generally in the presence of air, at temperature below their melting points is called
A. Calcination B. Roasting
C. Froth-floatation
D. Bessemerization

ANSWERS

1. B	2. C	3. C	4. B
5. A	6. D	7. B	8. D
9. D	10. D	11. D	12. D
13. D	14. C	15. B	16. D
17. A	18. D	19. D	20. D
21. C	22. D	23. D	24. D
25. A	26. D	27. D	28. C
29. C	30. A	31. D	32. D
33. C	34. C	35. A	36. D
37. B	38. D	39. D	40. C
41. D	42. C	43. A	44. B
45. A	46. D	47. D	48. D
49. D	50. A	51. B	52. B

6.6. COMPOSITES AND POLYMERS

1. What is the common reinforcement for polymer composites?
   A. Boron B. Ceramic
   C. Graphite D. Glass fiber
2. Which of the following fluids conducts electricity?
   A. Electrolyte B. Water
   C. Solution D. Aci
3. The engineering materials known as "plastics" are more correctly called ______.
   A. Polyvinyl chloride
   B. Polymers C. Polyethylene
   D. Mers
4. What is a combination of two or more materials that has properties that the components materials do not have by themselves?
   A. Compound B. Composite
   C. Mixture D. Matrix
5. What is a reference sheet for the elements that can be used to form engineering materials?
   A. Periodic Table B. Truth Table
   C. Building blocks of Materials
   D. Strength of Materials
6. Wood is composed of chains of cellulose molecules bonded together by another natural polymer called ______.
   A. plastic B. lignin
   C. Rubber D. additive
7. What is a polymer production process that involves forming a polymer chain containing two different monuments?
   A. Copolymerization
   B. Blending C. Alloying
   D. Cross-linking
8. What is the generic name of class of polymer which is commercially known as "nylon"?
   A. Polyacetals B. Polyamide
   C. Cellulose D. Polyester
9. By definition, a rubber is a substance that has at least ______ elongation in tensile test and is capable of returning rapidly and forcibly to its original dimensions when load is removed.
   A. 100 % B. 150 %
   C. 200 % D. 250 %
10. What is a method of forming polymer sheets or films into three-dimensional shapes in which the sheet is clamped on the edge, heated until it softens and sags, drawn in contact with the mold by vacuum, and cooled while still in contact with the mold?
    A. Calendaring B. Blow molding
    C. Thermoforming
    D. Solid phase forming
11. What is a process of forming continuous shapes by forcing a molten polymer through a metal die?
    A. Calendaring B. Thermoforming
    C. Lithugraphy D. Extrusion
12. What chemical property of a material which refers to its ability to resist deterioration by chemical or electrochemical reactions with environment?
    A. Stereo specificity
    B. Corrosion resistance
    C. Conductivity
    D. Electrical resistance
13. What refers to the tendency for polymers and molecular materials to

from with an ordered, spatial, three-dimensional arrangement of monomer molecules?

A. Stereo specificity
B. Conductivity C. Retentivity
D. Spatial configuration

14. What is the amount of energy required to fracture a given volume of material?

A. Impact strength
B. Endurance limit
C. Creep strength
D. Stress rupture strength

15. Some polymetric materials such as epoxies are formed by strong primary chemical bonds called ———.

A. Metallic bond
B. Van der Waals bond
C. Cross linking D. Covalent bond

16. What do you call a polymer without additives and without blending with another polymer?

A. Homo polymer
B. Ethenic polymer
C. Polyethylene D. Copolyme

17. A large molecule with two alternating mers is called as ———.

A. monomer B. elastomer
C. mers
D. copolymer or interpolymer

18. What term is used to describe a polymer that has rubber like properties?

A. Vulcanizer B. Elasticmer
C. Polychloroprene D. Elastomer

19. What is the most widely used dielectric material in the electrical and electronics industry?

A. Polymer B. Plastic
C. Rubber D. All of the above

20. What are natural or synthetic rubber like materials which have outstanding elastic characteristics?

A. Thermosetting plastics
B. Polymers C. Elastomers
D. Thermoplastic plastic

21. What are cellular forms of urethanes, polystyrenes, vinyls, polyehtylenes, polypropylenes, phenolics, epoxies and variety of other plastics?

A. Thermoplastic plastics
B. Plastic foams C. Polymers
D. Thermosetting plastics

22. What is the widely used electrical insulator?

A. Plastic B. Polymer
C. Epoxy D. Paper

23. What refers to the average number of mers in the molecule, typically several hundred to several thousand?

A. Polymerization constant
B. Polymerization factor
C. Degree of polymerization
D. Polemerization index

ANSWERS

1. D	2. A	3. B	4. B
5. D	6. B	7. A	8. B
9. C	10. C	11. D	12. B
13. A	14. A	15. C	16. A
17. D	18. D	19. B	20. C
21. B	22. A	23. C	

6.7. GENERAL INDUSTRIAL CHEMISTRY

1. If the difference in boiling points is not greater than 25⁰C, then separation of a mixture into its component parts will be performed with
   (A) Distillation
   (B) Fractional distillation
   (C) Sublimation
   (D) Fractional filtration

2. For the evaporation of liquids that are heat sensitive, ——— evaporators are used
   (A) Vacuum (B) Open Pan
   (C) Horizontal tube
   (D) Vertical tube

3. ——— evaporator has the advantage in terms of energy costs.
   (A) Falling film (B) Rising film
   (C) Long tube (D) Multiple effect

4. Efficiency of the heat exchanger equipment are depends upon
   (A) the heat transfer coefficients
   (B) mixed flow pattern
   (C) parallel flow of both liquids
   (D) None of above

5. ——— is used to provide the driving force in some filters
   (A) Centripetal force
   (B) Gravitational force
   (C) Centrifugal force
   (D) Rotational force

6. Rotary vacuum filters are expensive, but they do provide
   (A) a considerable degree of mechanization and convenience
   (B) mechanical strength to the equipment
   (C) economics to attaining the pressure
   (D) greater costs of maintaining

7. The extracted sugarcane juice is filtered and screened to remove
   (A) Dissolved impurities
   (B) Floating impurities
   (C) Suspended impurities
   (D) All of above

8. Sucrose is a disaccharide consist of two monosaccharide
   (A) Glucose and lactose
   (B) Glucose and glactose
   (C) Glucose and glucose
   (D) Glucose and fructose

9. Treatment of sugar cane juice with lime is known as
   (A) Defecation (B) Affination
   (C) Steeping (D) Washing

10. The screened juice is treated with lime to
    (A) Increase the pH
    (B) Coagulated the colloidal impurities
    (C) Crystalize the sucrose
    (D) Both a & c

11. Ca $(OH)_2$ convert soluble ——— of sugar cane juice into insoluble salts
    (A) Organic acids (B) Proteins
    (C) Chlorophyll (D) Waxes

12. The process consists of mixing the sugar with a saturated syrup to soften the adhering film of molasses is known as
    (A) Defecation (B) Affination
    (C) Carbonation (D) Sulphonation

13. Waste from sugar industries like molasses is used for manufacturing of
(A) Ethyl acetate (B) Acetone
(C) Ethyl alcohol (D) Benzene

14. Waste from sugar industries like baggas is used for the manufacturing of
(A) Paper (B) Leather
(C) Paints (D) Solvents

15. The corn grain consist of
(A) 80-82% starch (B) 10-25 % starch
(C) 50-60 % starch (D) 30-40% starch

16. Sulphur dioxide is added into Corn Steep water to
(A) Stop the growth of microorganism
(B) Remove the lipids
(C) Remove invert sugars
(D) Remove fiber

17. ——— is used for separation of starch and germs from corn
(A) Heat exchanger
(B) Cyclone separator
(C) Rotary filter (D) Plate filter

18. During steeping of corn, required concentration of SO_2 is
(A) 10-20% (B) 5-10%
(C) 0.1-0.2% (D) 20-30%

19. A dye should have ——— to the substance which it being applied
(A) Solubility (B) Affinity
(C) Insolubility (D) Leveling

20. Pigments are generally ——— and has less affinity for substance
(A) Soluble (B) Insoluble
(C) Miscible (D) dissolve

21. Cellulosic fiber is dyed with direct dyes at
(A) Ambient temperature
(B) Low temperature
(C) High temperature
(D) Critical temperature

22. Acid dyes are also known as
(A) Anionic dyes (B) Cationic dyes
(C) Amphoteric dyes
(D) Neutral dyes

23. ——— dyes require a pretreatment of fiber with aluminum, chromium and iron etc.
(A) Acidic (B) Mordant
(C) Reactive (D) Basic

24. Vat dyes have to be converted into soluble ——— form
(A) Colorless leuco (B) Colored leuco
(C) lake (D) complex

25. ——— dyes are used for hydrophobic fibers
(A) Acid (B) Base
(C) Mordant (D) Disperse

26. Reactive dyes form ——— bond with fiber
(A) Ionic (B) Co-ordinate
(C) Metallic (D) Covalent

27. In reactive dyes ,Cynuric Chloride reactive system is based on
(A) Neucleophilic substitution
(B) Neucleophilic addition
(C) Oxidation (D) Reduction

28. In reactive dyes, vinyl sulphone reactive system is based on
(A) Neucleophilic substitution
(B) Oxidation (C) Reduction
(D) Neucleophilic addition

29. ———is used as flux.
(A) CaO (B) SiO_2.
(C) Na_2O (D) NaCl

30. Which one of the following set of raw material is most suitable for manufacture of urea?
(A) CH_4N_2 and CO_2
(B) H_2 , N_2 and CO
(C) N_2,H_2, CO_2 and H_2O
(D) H_2O, N_2 and H_2

31. Sugar colorant strongly fixed with
(A) Anion exchange resin
(B) Cation exchange resin
(C) Amphoteric resin
(D) Neutral resin

32. ——— remove the color, producing a white sugar crystals
(A) Washing
(B) Ion exchange resin
(C) affination (D) Refining

33. SIC and BN are classified as
(A) Oxide Ceramic
(B) Non oxide ceramic
(C) Ceramic composition
(D) Glasses

34. $BaTiO_3$ is usedfor the manufacturing of
(A) Glass (B) Cement
(C) Capacitors (D) Magnets

35. In slip casting process moulds made of ——— are used
(A) Metal (B) Clay
(C) Plaster of Paris
(D) Glass

36. In traditional ceramics Feld spar is used as
(A) Stabilizer (B) Flux
(C) Former (D) Thickener

37. Feld spars are ——— minerals found in nearly all igneous rocks
(A) Alumino-silicates
(B) Boro silicates (C) Zinc silicates
(D) All of above

38. Glaze provides
(A) Smooth surface
(B) Porous Surface
(C) Crack surface (D) None of above

39. Lead glass contain main Constituents
(A) Al_2O_3 and B_2O_3
(B) PbO and Al_2O_3
(C) PbO and SiO2
(D) MgO,PbO and CaO

40. Windows glass contained ——— % of silica
(A) 39 % (B) 50%
(C) 87% (D) 72%

41. In safety glasses several layers of glass are bound together with
(A) wire (B) glue
(C) gum
(D) Transparent adhesives

42. Advanced oxide ceramics have superior properties such as ———
(A) Semiconductor
(B) Electrically insulator
(C) Soft sheet like
(D) Super capacitor

43. Advanced non oxide ceramics have superior properties such as ———
(A) Conductor
(B) Electrically insulator
(C) Soft sheet like
(D) Super capacitor

44. Silicon carbide and titanium carbides are extremely ——— materials
(A) Soft (B) Hard
(C) brittle (D) Ductile

45. C_3S has ——— heat of hydration than C_2S
(A) lower (B) equal
(C) higher (D) negligible

46. High early strength cement contains increased amount of ———
(A) C_3S (B) C_2S
(C) C_3A (D) C_4A

47. Word ceramics is derived from Greek word ———
(A) Keramos (B) ceramose
(C) Ceramics (D) none of these

48. ——— glass is used in laboratory wares.
(A) clear glass (B) lead glass
(C) Pyrex
(D) laminated glass

49. ———— is a heat-treatment cycle that prevents glass from harmful stress.
A. Forming B. Annealing
C. Batching D. none of these

50. In glass or vitreous state solid the atoms are arranged in ————.
A. Regular fashion
B. Random fashion
C. Linear fashion D. None of these

ANSWERS

1. B	2. A	3. D	4. A
5. C	6. A	7. B	8. D
9. A	10. D	11. A	12. B
13. C	14. A	15. A	16. A
17. A	18. C	19. B	20. B
21. C	22. A	23. B	24. A
25. D	26. D	27. A	28. C
29. C	30. C	31. A	32. B
33. B	34. C	35. C	36. A
37. A	38. A	39. B	40. C
41. D	42. B	43. A	44. B
45. C	46. C	47. A	48. C
49. C	50. B		

Part Seven

PUNJAB PUBLIC SERVICE COMMISSION PREVIOUS PAPERS AND EXIT EXAMINATION

PUNJAB PUBLIC SERVICE COMMISSION
LECTURER CHEMISTRY (BS-17) 2015

Time: 120 minutes
Questions: 100

Name:
Roll No.

Instructions

1. Write your allotted Roll No. in the top right corner of QUESTION PAPER and in the specified place of ANSWER SHEET.
2. Read QUESTION PAPER carefully and mark your answer on the ANSWER SHEET.
3. Each question has four options. Fill only one box that you think is the correct answer. Each question carries 1 mark. 0.25 mark will be deducted for each incorrect answer,
4. Instructions for filling box have been given on the Answer Sheet. Read them carefully before you attempt.
5. Read the instructions for filling your ROLL NO. and marking your answer on the ANSWER SHEET carefully before you start answering.
6. Sign the Answer Sheet in the box provided at the bottom corner.
7. Return both Question Paper and Answer Sheet, to the Staff, at the end of the test.

1. Enzymes are:
(A) Fatty acids (B) Vitamins (C) Proteins✓ (D) None of these

2. Enzymes belong to which class of compounds?
(A) Polysaccharides (B) Polypeptides✓
(C) Polynitro heterocyclic compounds (D) Hydrocarbons.

3. The Helical Structure of protein is stabilized by.
(A) Peptide bonds (B) Dipeptide bonds
(C) Hydrogen bonds✓ (D) Van der Waals forces

4. The function of enzymes in the living system is to.
(A) Transport oxygen (B) Provide immunity
(C) Catalyze biochemical reactions✓ (D) Provide energy

5. Which one of the following vitamins checks night blindness?
(A) A ✓ (B) B (C) C (D) D

6. Which of the following is an example of Zwitter Ion?
(A) Alanine (B) Glycine hydrochloride✓
(C) Both A and B (D) None

7. What does IR spectroscopy allow us to determine?
(A) The number of carbons in a compound
(B) The Kinds of bonds in a compound (C) The molecular formula of a compound
(D) The carbon-hydrogen framework of a compound✓

8. March gas contains:
(A) CO (B) H_2S (C) CH_4✓ (D) C_2H_2

9. Which of the following solvents is the best to use when taking IR spectrum?
(A) CCl_4✓ (B) Methanol (C) Water (D) Ethanol

10. A Strong peak between 1700 and 1760 cm^{-1} in an infrared spectrum most likely indicates:
(A) The presence of an alkene (B) The presence of a saturated compound
(C) The presence of an alkyne
(D) The presence of a carbonyl compound✓

11. What type of radiation is used in Nuclear Magnetic Resonance Spectroscopy?
(A) Visible light (B) Ultraviolet light (C) Radio waves✓ (D) Micro waves

12. Experimental evidence for the existence of atomic nucleus comes from:
(A) Millikan's oil drop method (B) Atomic absorption spectroscopy
(C) The magnetic bending of cathode rays (D) Alpha scattering by a thin metal foil✓

13. Which of the following is false in case of an electron?
(A) It is a particle (B) It has a wave property
(C) It emits energy while moving in orbits✓
(D) Its motion is affected by magnetic field

14. Which of the following is whole number?
(A) Atomic weight (B) Atomic number✓
(C) Atomic radii (D) Equivalent weight

15. Electronic configuration of M^{2+}ion is 2,8,14 and its atomic weight is 56 amu. The number of the Neutron in the nucleus are.
(A) 30 (B) 32✓ (C) 34 (D) 42

16. The ratio between the neutrons present in C and Si with respect to atomic masses 12 and 28 is:
(A) 3:7✓ (B) 7:3 (C) 3:4 (D) 6:28

17. The energy required to separate the nucleons from a nucleotide is catcalled:
(A) Nucleus energy (B) lionization energy
(C) Binding energy✓ (D) None

18. The stability of the nucleus mainly depends on the number of:
(A) Proton and neutrons✓ (B) Neutrons and electrons
(C) Protons and electrons (D) All of these

19. The difference between the total mass of the particle present and the real mass of an atom is called:
(A) Mass (B) Energy (C) Mass defect✓ (D) Binding energy

20. A certain mass of gas occupies a volu of 2L at S.T.P keeping the pressure constant at what temperature would ther occupy a volume of 4 L ?
(A) 273°C (B) 546°C✓ (C) 50°C (D) 100°C

21. The difference between crystalloid and colloid is of:
(A) Solubility (B) Diffusion
(C) Particle size ✓ (D) Chemical Composition

22. A liquid is found to scatter a beam of light but leaves no residue when passed through filter paper. The liquid can be described as:
(A) True solution✓ (B) Colloidal solution
(C) Suspension (D) Oil

23. At equilibrium which of the following reaction is not affected by pressure:
(A) ½ N_2 (g)+1/2 $O_2 \leftrightarrow NO$✓ (B) $PCl_5(g) \leftrightarrow PCl_3(g) + Cl_2(g)$
(C) SO_2Cl_2 (g) $\leftrightarrow SO_2$ (g)+Cl_2(g) (D) SO_2Cl_2 (g) $\leftrightarrow SO_2$(g) + Cl_2 (g)

24. In the Lime kiln, the reversible reaction $CaCO_3 \leftrightarrow CaO + CO_2$ proceeds to completion because:
(A) CO_2 escapes✓ (B) CaO is removed
(C) OF low temperature (D) OF high pressure

25. In which of the following cases does the reaction go farthest to completion.
(A) $K=10^2$ (B) K=1 (C) K=10 (D) $K=100^{-2}$✓

26. The unit of equilibrium constant Kc from the reaction $N_2 + 3H_2 \leftrightarrow 2NH_3$ + Q cal will be.
(A) $Liter^2 mole^{-2}$ (B) $Mole^2 litre^{-2}$ (C) Mole $Liter^{-1}$ (D) No Unit✓

27. The term active mass of a substance is used to denote the number of.
(A) Grams per liter (B) Molecules per liter
(C) Gram atoms per liter (D) Gram molecules per liter✓

28. For a reversible reaction to reach an equilibrium state the reaction is said to be carried outs
(A) Glass vessel (B) Iron vessel (C) Open vessel (D) Closed vessel✓

29. According to Le Chiseller's Principle, adding heat to a solid and liquid in equilibrium will cause the:
(A) An amount of solid to decrease✓ (B) Amount of liquid to decrease
(C) Temperature to rise (D) Temperature to fall

30. Preparation of Ice cream is based on the principle of.
(A) Exchange of solvent (B) Peptization
(C) Coagulation (D) None of these✓

31. The random motion of colloidal particle in the dispersion medium is referred to as:
(A) Adsorption
(B) Coagulation
(C) Brownian movement✓
(D) Tyndall effect

32. In the hydrogenation of oils the catalyst used is:
(A) Nickel ✓
(B) Platinum
(C) Iron
(D) Copper

33. When the dispersion medium is gas the colloidal system is known as:
(A) Aerosol✓
(B) Alcosol
(C) Benzosol
(D) Hydrosol

34. The equation, which describes the quantitative relationship between pressure and the amount of gas absorbed at constant temperature is known as.
(A) Freundlich Equation
(B) Langmuir Equation✓
(C) B.E.T equation
(D) None

35. Which of the following adsorption takes place at low temperature?
(A) Physical adsorption✓
(B) Chemical adsorption
(C) Sorption
(D) Desorption

36. Colloidal particles are.
(A) Positively charged
(B) Negatively charged
(C) Either positive or negative charged✓
(D) Neutral

37. Among the following reactions the fastest one is.
(A) Burning of coal
(B) Conversion of monoclinic sulphur to rhombic sulphur
(C) Rusting of iron
(D) Precipitation of AgCI by mixing $AgNO_3$ and NaCl Solutions✓

38. The term -dx/dt in the rate expression refers to the.
(A) Change in concentration of the reactant with time
(B) Instantaneous rate of the reaction✓
(C) Average rate of reaction
(D) Increase in the concentration of the reactants

39. Which one of the following compounds is depleting the ozone umbrella?
(A) Chloroform
(B) Chloroflurocarbon✓
(C) Bromo Methane
(D) None

40. Molecularly of chemical reaction.
(A) always whole number✓
(B) Cannot be less than 2
(C) Can have a fraction value
(D) Can be zero

41. Inversion of cane sugar in aqueous solution to glucose and fructose is an example of:
(A) Fast reaction
(B) Slow reaction✓
(C) Spontaneous reaction
(D) Instantaneous reaction

42. The rate of chemical reaction.
(A) Increases as the reaction proceed
(B) Decreases as the reaction proceed✓
(C) Both A & B
(D) Remains constant as the reaction proceed

43. Under a given set of experimental conditions with increase in concentration of the reactant the rate of chemical reaction:
(A) Increases✓
(B) Decreases
(C) Remain unchanged
(D) First increase and then decrease

44. Point out the correct statement
(A) Rate law is an experimental fact whereas the law of mass action is a theoretical proposal✓
(B) Rate law is always different from the expression of law of mass action
(C) Rate law is more, Informative than law of mass action for the development of mechanism
(D) Order of a reaction is equal to the sum of powers of concentration term in rate law

45. Order of a reaction.
(A) Can be written from the balanced chemical equation.
(B) Depends on the stiochiometric coefficient of reactants and products
(C) Can have fractional value✓
(D) Cannot be determined experimentally

46. A catalyst increases the rate of reaction by:
(A) Decreasing activation energy✓
(B) Increasing their activation energy
(C) Reacting with reactants
(D) Reacting with products

47. Marine correct statement in case of Reversible reaction:
(A) Catalyst catalyses the forward reaction✓
(B) Catalyst catalyzes the backward reaction
(C) Catalyst Influence the direct and reverse reaction to the same extent
(D) Catalyst Increase the rate of forward reaction and decrease the rate of reverse reaction

48. Tip element which has highest electrical conductivity is:
(A) Silver ✓
(B) Gold
(C) Copper
(D) Aluminium

49. Which of the following aqueous solution will conduct an electric current quite.
(A) Sugar
(B) Glycerol
(C) Pure water
(D) HCl✓

50. Pure water does not conduct electricity because it is.
(A) Neutral
(B) Readily decomposed
(C) Almost unionized✓
(D) Completely ionized

51. Molten KCl conduct electricity due to presence of:
(A) Free ions✓
(B) Free electrons
(C) Free molecules
(D) Atoms of potassium and chloride

52. Which quantities are required to calculate the enthalpy change of formation of gaseous sodium ions?
(A) Enthalpy changes of atomization of sodium✓
(B) First ionization energy of sodium
(C) Enthalpy change of formation of sodium
(D) None of these

53. The temperature of system decreases in an:
(A) Adiabatic expansion
(B) Isothermal expansion
(C) Adiabatic compression✓
(D) Isothermal compression

54. The system in which there is no exchange of heat between system and surrounding is called:
(A) Isobaric process
(B) Isochoric process
(C) Adiabatic process✓
(D) Isothermal Process

55. An Isothermal process is one in which:
(A) $\Delta E=0$
(B) $\Delta T=0$✓
(C) $\Delta V=0$
(D) $\Delta AE=W$

56. Process of evaporation of liquid is accompanied by:
(A) increase in enthalpy
(B) Decrease in enthalpy
(C) Increase in entropy✓
(D) No change in free energy

57. Entropy decrease in:
(A) Melting of ice
(B) Rusting of iron
(C) Vaporization of camphor
(D) Crystallization of sucrose from solution✓

58. Entropy of universe is always.
(A) Increasing✓
(B) Decreasing
(C) Zero
(D) Constant

59. According to Bronsted-Lowry concept, a base is a substance which act as.
(A) A proton donor
(B) An electron donor
(C) An proton acceptor✓
(D) An electron acceptor

60. According to Lewis concept base is a substance which:
(A) Accepts proton
(B) Donates proton
(C) Accepts a lone pair of electron✓
(D) Donates a lone pair of electron

61. The weakest Lewis base is:
(A) H^-✓
(B) OH^-
(C) Cl
(D) HCO_3^-

62. Which one of the following least resembles and ideal gas?
(A) Ammonia
(B) Helium
(C) Hydrogen
(D) Trichloromethane ✓

63. Compound X does not conduct electricity when in a liquid state, when added to water produces a solution that readlly conducts electricity. What could X be?
(A) $MgCl_2$ ✓
(B) $SiCl_4$
(C) PCl_3
(D) None of these

64. A compound that does not give a positive test in Lassaigne's test for N is.
(A) Azobenzene✓
(B) Glycine
(C) Urea
(D) Phenyl hydrazine

65. A gas decolorizes alkaline KMnO4 solution but does not precipitate with amonical $AgNOS_3$ solution, it is:
(A) Ethylene ✓
(B) Ethane
(C) Methane
(D) Acetylene

66. Chlorine reacts with hot concentrated aqueous sodium hydroxide according to the question below.

$$3CI_2 + 6NaOH(aq) \rightarrow NaClo_3(aq) + 5NaCI(aq) + 3H_2O(l)$$

Which conclusion can be drawn from the information?
(A) The oxidation state of the chlorine in one of the products is +5. ✓
(B) The Chlorine undergoes disproportionate.
(C) The sodium hydroxide acts as a reducing agent
(D) None of these

67. For a compound to be purified by steam distillation:
(A) Impurities must be nonvolatile✓ (B) Liquid must be immiscible with water
(C) Molecular weight of the compound is expected to be high
(D) All are correct

68. Modern cars are fitted with catalytic converters. These remove carbon monoxide, unborn hydrocarbons and oxides of nitrogen from exhaust gases. Which of these pollutant gases are removed by oxidation?
(A) Carbon monoxide✓ (B) Hydrocarbons
(C) Nitrogen oxides (D) None of these

69. Oxidizing action increases in the following order.
(A) Cl <Br<I<F (B) Cl <I<Br<I<F (C) I<Br<CI<I<F✓ (D) I<F<CI<I<Br

70. Point out the false statement. Strong oxidizing character is favored by:
(A) Low ionization energy of the halogen atom ✓
(B) High electron affinity of the halogen atom
(C) High hydration energy of the gaseous halide ion
(D) Low heat of dissociation of the molecular halogen

71. The EAN of Ni in NI(CO)4 is.
(A) 38 (B) 56✓ (C) 18 (D) 54

72. Complex with multidentate ligands are called:
(A) Chelates✓ (B) Coordination complexes
(C) Covalent complexes (D) None of these

73. Molecular compounds in which the individual components lose their identity are called:
(A) Complex compounds✓ (B) Lattice compounds
(C) Simple salts (D) All of these

74. The benzene molecule contains:
(A) Six sp^2 hybrid carbons ✓ (B) Six sp^3 hybrid carbons.
(C) Three sp^2 hybrid carbons (D) Three sp^3 hybrid carbons

75. In benzene there are:
(A) 3 π electrons (B) 4 π electrons (C) 8 π electrons (D) 6 π electrons✓

76. Which of the following acid can be used as catalyst in Friedel-Craft reaction?
(A) $AlCl_3$✓ (B) HNO_3 (C) $BeCl_2$ (D) $ZnCl_2$

77. Six carbon atoms of benzene are proposed by:
(A) One type✓ (B) Two types (C) Three types (D) Six types

78. The cyclic formula for Benzene was proposed by:
(A) Kekule ✓
(B) Dewar
(C) Armstrong and Baeyer
(D) Landerberg

79. Alkyl groups are o-, p-directing because of:
(A) Inductive effect
(B) Resonance effect
(C) Resonance effect through hyper conjugation✓
(D) All of these

80. The Cl atom attached to Benzene ring is:
(A) o-directing
(B) m-directing
(C) o-and p-directing and activating
(D) o-and p-directing and deactivating ✓

81. Benzene is converted to toluene by:
(A) Grignard reaction
(B) Perkin reaction
(C) Friedel Crafts reaction ✓
(D) Wurtz reaction

82. Which of the following is least soluble in water?
(A) Ethanol (B) Phenol (C) Benzoic acid (D) Benzene✓

83. Which of the following is not explosive?
(A) Trinitrobenzene
(B) Trinitrotoluene
(C) Nitro glycerine
(D) o-Amino Toluene ✓

84. The oxide and chloride of an element X are separately mixed with water. The two resulting solutions have the same effect on litmus. What is element X?
(A) Sodium (B) Magnesium (C) Aluminum (D) Phosphorus✓

85. Which alcohol may be oxidized to a product which reacts with 2,4-dinitrophenylhydrazine reagent but not with Fehling's reagent?
(A) Butan-1-ol
(B) Butan-2-ol
(C) 2-methylporpan –2-01
(D) 2-methlyproparin-2-ol✓

86. Which compound is a product of the hydrolysis of $CH_3CO_2C_3H_7$ by boiling aqueous sodium hydroxide?
(A) CH_3OH (B) C_3H_7OH✓ (C) $C_3H_7CO_2H$ (D) $C_3H_7CO^{-2}Na^+$

87. Phenolphthalein is colourless in acidic medium because it has:
(A) Benzenoid structure
(B) Quinoid structure
(C) Dissociated structure
(D) Undissociated structure✓

88. Fluorescein, tatrazine, rhodamine and chromotrope are examples of:
(A) Acid base indicators
(B) Adsorption indicators✓
(C) Mixed indicators
(D) Extractive indicators

89. The Indicator that should not be added in the volumetric flask in which the titration is carried out:
[redacted] Self indicator ✓
(B) Internal indicator
(C) External indicator
(D) Mixed indicator

90. In the manufacture of sulphuric acid plantinlsed asbestos is used as a catalyst, It is an example of:
(A) Promoter
(B) Autocatalysis
[redacted] Heterogeneous catalysis✓
(D) Homogeneous catalysis

91. Theory of heterogeneous catalysis is based upon phenomenon of:
(A) Absorption
[redacted] Adsorption✓
(C) Sorption
(D) Dissociation

92. The first attempt to classify elements was made by:
[redacted]) Dobereiner✓
(B) Newland
(C) Mendleef
(D) Lother Meyer

93. Elements of same vertical group of the Periodic Table have.
(A) Same atomic size
(B) Same electronic configuration
(C) Same number of atoms
[redacted]) Same number of electrons in the outer most shell of their atoms✓

94. Elements of group 1B are called.
[redacted]) Coinage metals✓
(B) Rare earth metals
(C) Transition elements
(D) Normal Elements

95. Which one of the following phenomenon will occur when two atoms of the elements having same spin of electrons approach for bonding?
(A) Orbital overlap will not occur
(B) Bonding will not occur
[redacted]) Both A & B✓
(D) None of these

96. Molecular orbitals are filled with electrons according to:
(A) Aufbau principle
[redacted]) Hund's rule✓
(C) Pauli exclusion principle
(D) All of these

97. Resonating forms of a molecule can:
(A) Be separated
[redacted]) Never be separated✓
(C) Either A Or B
(D) None

98. The oxidation number of P in KH_2PO_4 is.
(A) +1
(B) +3
(C) -3
[redacted]) + 5✓

99. A mixture in heating with concentrated H_2SO_4 and MnO_2 liberates brown vapors of:
(A) NO_2
[redacted]) Br_2✓
(C) Cl_2
(D) I_2,